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Banquet Tendered John P. Buckley

Radicalism Gone Mad—*Editorial*

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Original Communications

FIFTY YEARS' OBSERVATION OF ORAL SURGERY

By THOMAS L. GILMER, M.D., D.D.S., Chicago, Illinois

(Read before the Illinois State Dental Society, Springfield, Illinois, May 9-11, 1922)

THE term "oral surgeon" is applied to one who specializes in surgical operations on the mouth, jaws and face. The name probably originated with the late Professor James E. Garretson (M.D., D.D.S.,), of Philadelphia. He also founded the only hospital of oral surgery that ever existed. In 1866 the curriculum of the dental department of the University of Pennsylvania was made to include a new branch of teaching, named oral surgery and associate surgery, and Garretson was appointed to fill the chair established. It was for both medical and dental students of the University. Later, other dental schools, following the lead of the University of Pennsylvania, added oral surgery as an integral part of dentistry, and at present all dental schools in America have chairs of oral surgery. Garretson doubtless was father of the thought that there was room in medical practice for another specialty which should embrace mouth and jaw diseases, injuries and deformities. The conception of a specialty which included the regions indicated was not kindly received by the medical profession either in this country or in England. Medicine was unwilling to embrace, as a part of its practice, any part of the services rendered at that time by the dentist. Another reason given for opposing this new specialty in medicine was that it has no natural anatomical boundaries to limit it. It would seem, from contemporaneous and subsequent written statements by Garretson that he had no thought of connecting oral surgery with dentistry as a specialty. In the preface to the sixth edition of his book, *A System of Oral Surgery*, Garretson expresses the opinion that oral surgery is not a part of dentistry but that

DR. JOHN P. BUCKLEY (..), GUEST OF HONOR, AT THE ANNUAL BANQUET OF THE CHICAGO DENTAL SOCIETY

dentistry is a branch of oral surgery. In other words, oral surgery is a part of medicine, and dentistry, being a part of oral surgery, is therefore or should be a part of medicine.

To further show that Garretson had no thought that oral surgery should become a part of dentistry, I quote an excerpt from a letter written in 1881 by him to Truman W. Brophy and Eugene S. Talbot. He says:

> I assume the liberty, arising out of age, to advise that you will call yourselves oral surgeons. Go into the American Medical Association, not as dentists, but as oral surgeons—gentlemen of full medical education. Dentistry is claimed by many as a profession. Let it remain so and let all hold to that view who please. Join with those who are working to make a new specialty. The result is rapidly showing itself. If you conclude to use the term "oral surgeon" I will be most happy in urging in your behalf (in the A. M. A.) any influence I possess. If possible I propose to be at the meeting as a member of the Philadelphia Medical Society.

This letter was written at the time when it was proposed that a section of oral surgery be organized in the American Medical Association, which later was established, admitting at that time only dentists having the M.D. degree. Later the name of the section was changed to stomatology.

Garretson's attempt to establish a specialty of oral surgery in medicine was a failure, due in part to the adverse attitude of members of his own profession and probably in part to lack of interest shown in the specialty by medical students. The dental schools adopted the name "oral surgery" and made it a special branch of dentistry, and it has remained such ever since. While oral surgery is in reality a branch of general surgery it has developed largely out of dentistry into and toward medicine.

Medical men, with few exceptions, recognize oral surgery as a specialty either in medicine or in dentistry. No medical or general dictionary, so far as I have been able to discover, gives the name "oral surgery," while all other kinds of special surgery, including dental surgery (defined as dentistry in general), orificial and veterinary surgery are each given a place. This may be due to the fact that so few limit their work to surgery of the mouth, jaws and face.

It is a strange fact that an oral surgeon is generally referred to as a dentist or as a dental surgeon, tho he may have been educated in a regular medical school in addition to his dental training, and specializes in oral surgery, doing surgical work appreciated by medical men who personally know of its value.

There are no oral surgeons in the army. Instead there are *dental* surgeons. Perhaps a sufficient reason for this is found in the fact that the army corps' requisite is, not for oral surgeons, but specifically for dentists—that is, for men who can give dental service in addition to doing minor surgical operations, such as extraction of teeth, lancing of abscesses, making and adjusting splints for fractured jaws. Stomatology is seemingly no more popular as a name than is oral surgery. For over a quarter of a century there has been a section of stomatology in the American Medical Association, formerly entirely composed of dentists with medical degrees, but one rarely hears of those making a specialty of mouth diseases referred to as stomatologists. In the minds of most physicians, as well as the entire lay population, one is a dentist if he has graduated from a dental school, tho he may have qualified as a medical practitioner and confines his practice wholly to surgery of the jaws and face. It seems difficult, except among dentists, to secure a recognition of oral surgery as a specialty in either medicine or dentistry, or of stomatology for the treatment of diseases of the mouth and teeth. In medical and general dictionaries, the term "dental surgeon" practically stands alone in having a prefix (dental) as a descriptive adjective indicating the kind of surgery practiced. Unless many more specialize in surgery of the mouth, or some effort

is made to popularize the term, it may be logically surmised that the name "oral surgery" will not soon assume an important place among either the professional or lay population. At this time there are three rather distinct kinds of oral surgeons: first, the medical graduate who has had no dental training, but who devotes his entire time to surgery of the mouth, face and jaws; second, the medical and dental graduate who devotes his time to oral surgery; and third, the dental graduate who practices oral surgery, but who is not a graduate of medicine.

The oral surgeon who has had no training in a dental school and who has had no experience in dental practice works under a handicap because he has had little training in oral pathology. Neither has he had the finger training which the dentist has received, therefore he finds it more difficult to develop a good oral technic. On the other hand, he has an advantage over one who has had no training other than that received in the dental school, because he has had in addition to his thoro medical training, an interneship in a good hospital which affords general medical and surgical practice, giving him a broader conception of disease and of operative procedures in general. The oral surgeon who has had both medical and dental training, everything else being equal, should be better equipped for practice than one who has had only the one or the other.

A dentist who aspires to the practice of oral surgery, unless he has had a medical education, meets with a difficulty in case his patient dies during or soon after an operation, since he is unable to write a death certificate. There exists an anomalous condition which qualifies one to practice oral surgery and at the same time does not allow him to certify in case of the death of his patient.

The dental school is chartered by the state to educate individuals for the practice of dentistry. Those selected to fill the various chairs, under the state charter, are legally qualified to make rules and regulations governing the school and to formulate a curriculum. Under the statute the governor of a state appoints a board of dental examiners. The curricula of all dental schools include oral surgery as one of their several departments. The dental board recognizes the mandate of the statute and passes on the qualifications of applicants, graduates from dental schools and grants licenses to practice dentistry, which includes, as an integral part, oral surgery. It is therefore but a natural surmise that a regularly qualified dentist has the right to practice anything taught in a dental school, including oral surgery—and doubtless he has that right, but as before said, in case of death resulting from an operation or from some other cause during convalescence he cannot write a death certificate, as the Medical Practice Act says that regularly qualified physicians and coroners only may write death certificates.

Major surgical operations carry with their performance a percentage of mortality; therefore, if one practicing oral surgery has not the legal right to sign a death certificate, but has a death as the result of an operation, he must call in the coroner to hold an inquest.

As years have gone by, I have grown more and more to believe that too much time is devoted, in the dental schools, to major operations in the oral surgical clinics, such as cleft palate and other major operations, since so few of the graduates specialize in oral surgery. However, the student should see sufficient of these operations to give him an intelligent understanding of the subject, and he cannot see too much of oral pathology. He may not expect to perform major surgical operations for the removal of malignant and other growths of the jaws and mouth, but he must be able to recognize them when he sees them. It is the dentist's duty to discover and recognize oral malignant growths in their earlier stages when operation offers the

best opportunity for their permanent cure. If he does not feel qualified to do the more difficult surgical operations, he can refer his patient to those who are qualified for this service. During the past fifty years there has been a great advance along these lines by the dentist thru instruction received in the department of oral surgery in dental schools. When I first commenced the teaching of oral surgery, there was a definite lack of interest in the subject on the part of students and practitioners generally, but lately there has been a marked increase in interest shown by both students and dentists.

Many beneficial results have come from the development of oral surgery. Among these is the lessening of mutilating operations on the jaws for the removal of cysts, odontomes, myeloid or giant cell sarcomas and other non-malignant growths.

The surgical engine introduced by Bonwill, a dentist, was afterward refined and improved by the late Professor Cryer, the oral surgeon who succeeded Professor Garretson in the department of dentistry in the University of Pennsylvania. His instrument was the prototype of several later inventions which are extensively employed by rhinologists, orthopedic and general surgeons. The electrically operated surgical engine has largely superseded the mallet and chisel, since it offers a more refined method for certain kinds of bone operations. The nitrous oxide-oxygen apparatus has been improved and refined for surgical anesthesia thru the influence of oral surgery; also, the ether vaporizer, now almost exclusively employed in surgery of the mouth and jaws; likewise the suction apparatus for removing blood from the field of operation, especially about the mouth and throat. The dental chair has found favor for surgical work about the mouth and face. Oral surgery has given the modern methods of treatment of jaw fractures exclusively. Improvement in palate operations may be credited to oral surgery. Much of this can and should be attributed to the efforts of Truman W. Brophy, who has popularized and offered improved methods for those operations. Unfortunate parents having a child born with this oral deformity can be cheered by the knowledge that oral surgery offers so much for the correction of the deformity. There are many other contributions from oral surgery to general and special surgery.

Under the present educational requirements for medical and dental education, if one wishes to qualify fully in both, his term of pupilage is ten years plus the pre-medical requirements. The question arises, does the practice of oral surgery offer inducement sufficient to attract many men to spend so much time in preparation? Another question may be propounded: Would it not be better for one who wishes to practice oral surgery to take the regular medical training and then supplement this with two years of special training in a dental school, instead of taking the whole of the dental course in addition to the medical course? Such a procedure would shorten his period of training and qualify him equally well if not better for the practice of oral surgery.

The dental graduate who chooses oral surgery for his specialty, unless he has preceded or succeeded his dental training by a medical education, labors under continuous difficulties if he practices oral surgery in its broader sense—that is, if he does major as well as minor surgery. In the first place, he lacks general medical and surgical knowledge. It is true that he may get this by self-teaching, but this is more difficult and is never so satisfactory as when received by systematic training in a well regulated medical school and hospital.

Some new practices in mouth surgery have found favor among some dentists during the last few years. One of these is known as the surgical removal of teeth. This method originated with the extraction specialists. Its supposed desir-

ability is based on the theory that all infected regions about chronically infected teeth can be more certainly removed by this method.

The operation consists of dissecting the mucosa and periosteum from the bone, exposing the labial or buccal, and, in some instances, the lingual plates of the process, which are then cut away so that the teeth may be easily removed, at the same time exposing the apical portion of the sockets of the roots to view and assuring opportunity to clear out all granuloma, so called, and the adjacent infected bone. After completion of the bone surgery, the gum flaps are brought together and sutured. I said granuloma, so called, because the term does not represent the condition. A granuloma as defined by Virchow, is "a tumor or neoplasm made up of granulation tissue." Tumor is defined by the best medical dictionaries as a "swelling; a morbid enlargement," "a neoplasm," "a mass of new tissue which persists and grows independently of its surrounding structure and which has no physiologic use." Granulation tissue found about the apices of abscessed teeth is not a swelling. It is not a neoplasm since it is not an abnormal tissue; neither does it grow independent of surrounding tissue, and it has a physiologic use; it is nature's first effort to rebuild the lost bone. It is unable to become mature tissue because of the presence of infection in the root of the tooth. When the tooth, the cause of the infection, is removed this granulation tissue usually becomes mature tissue completing the repair.

Another procedure following the extraction of abscessed teeth is the curettement of all sockets from which chronically abcessed teeth have been removed.

These methods do not appeal to all oral surgeons who practice oral surgery in its broader sense. If the surgical removal of teeth is confined to removal of definitely impacted teeth, or to the removal of a part of the bone for the better adjustment of artificial dentures where there is prognathism, or for removal of attenuated edges of the process resulting from the extraction of teeth, then it is not new and is good surgery.

Those who have made unprejudiced examination of large numbers of radiographs of edentulous or partially edentulous jaws, where the teeth have been removed by the usual method and with no surgical interference whatever, must have come to the conclusion that it is very rare that infection persists after extraction. When rarefied regions have persisted they are generally due to parts of encapsulated abscesses to small cysts or to non-infected connective tissue which has had no lime salts deposited in it.

One must not confuse the condition present in alveolar abscesses with osteomyelitis since the pathology is entirely dissimilar, and the bacteriology is almost universally different. The former being universally due to the streptococcus viridans the latter to the staphylococcus except in rare instances in the long bones when the prevailing organism is the hemolitic streptococcus. It is always secondary to infection from some other part of the body. Osteomyelitis infection indicates surgical interference for its treatment, as do jaw cysts.

There are several objections to the surgical removal of teeth. One of them is the increased danger of disseminating infection causing a bacteremia. The traumatism caused by extensive surgical procedure in such operations not only lowers the resistance of the adjoining tissues but it offers increased opportunities for the escape of the bacteria.

There is danger even in the removal of several badly infected teeth at the same time by the usual method, and curettement, or the more extreme operation, only adds to the danger. Numerous instances have come under my observation where serious results have followed the surgical removal of teeth. A Chicago physician told me only a few days ago that he was called in consultation to

another city to see a man who became seriously ill as a result of having his teeth removed surgically. Finally, unnecessary destruction of the process removes bone needed for the better support of dentures.

This statement of my observation of fifty years of oral surgery is too brief to include many other things which are important in the history of oral surgery.

Discussion

Truman W. Brophy, Chicago, Illinois: We have a great problem before us on this question, What will be done regarding the teaching of oral surgery? We are teaching oral surgery in all our dental colleges in this country, and when young men have finished their course they go out into practice and are placed in the position Dr. Gilmer has pointed out. Every surgeon who does a great deal of surgery now and then loses a patient, in spite of the most careful precautions and greatest care. If a dental graduate should lose a patient he is placed in the unfortunate position of being unable to make out a death certificate. He must call on someone else, or the coroner must take the case, get a jury, make an autopsy, and render a verdict before the body can be removed. If perchance the dental practitioner is fortunate enough to ask some friend to make out a death certificate, and he does so, that will end it. But this is an illegal act. The law specifically provides that a man must have been the attendant in order to make out a death certificate. If an interne in the hospital signs it and states he was present at the time of the operation, and knows the circumstances of the case, that may do. Internes will not always do that. The laws of the state of Illinois have been changed so that an interne can no longer sign a death certificate except in his own cases.

Here is the situation: Do a great many people believe sincerely that dentistry is a specialty of medicine? Is it? A medical graduate, who is licensed by the state in which he practices, is eligible to practice any specialty of medicine. He may say that he is an ophthalmologist, or an otologist, the first day he begins practice. He can practice anything he pleases. He may practice orthopedic surgery; he may treat cutaneous diseases; he may be an obstetrician or a gynecologist. He may do any of these things, but can he practice dentistry? No.

I asked a celebrated physician recently, who knows a great deal about dental teaching and dentistry, if in the medical school from which he graduated dentistry was taught him sufficiently to fit him to engage in its practice. He said it was not. I then asked whether dental histology were taught? No. Dental anatomy and physiology? No. Was there any teaching in dental pathology? No. How can a man expect to practice dentistry who goes thru such a course of training? Consequently dentistry is not a specialty of medicine in its broadest sense. All that pertains to dental histology, anatomy, physiology and pathology is, you might say, medicine, but the medical students do not get it.

Seven or eight years ago a questionnaire was sent to about sixty-five or seventy first-class medical colleges of this country to ascertain if they were teaching oral surgery. There were fifty replies that came back, and six of these stated they taught it. How can any one claim for a moment, when oral surgery is not taught as a part of the professional training that dentistry is a department of medicine? We know it is not and never can be, unless the medical colleges expand their curricula so as to include it and lengthen the course to eight years. It takes nine years to take the prescribed course in medicine and dentistry, and at the end of that time a man is too old to acquire the digital facility necessary to become a skilful dentist. So some other plan must be worked out. Some fertile, judicious, philosophic mind must bring his powers of observation and originality to bear on this problem and solve it, and let us know how a man can become a dentist and what he is required to do in these days; tell us how a physician may be trained in oral surgery in all of its branches, and how best the people may be served by the men they call upon to serve them. After solving that problem, the teachers of this and other countries may take up the question and prepare young men for their duties. It has not yet been done. Let us hope it may be done.

Why do we teach oral surgery? We should not be teaching anything a student cannot practice. The authorities should know what dental graduates have learned, and the young men should be given credit for what they know. They have not had extensive training in general pathology, they have not studied systemic diseases in all of their aspects as medical students have done, but they have devoted four years to the studies of histology, anatomy, physiology, bacteriology, pathology, materia medica, therapeutics, physical diagnosis, the principles of surgery and oral surgery, together with the intricacies of practical dentistry in all its branches. I believe dental students should devote more time to the study of general pathology. A distinguished professor of surgery recently said that he felt sure the dental graduate of today was quite as well equipped to assume the duties of his profession as the medical graduate.

With regard to the section on stomatology of the American Medical Association, its first

name was section of dental and oral surgery. Subsequently it was changed to stomatology. We do not know of many people who call themselves stomatologists. There are some oral surgeons. At the time the section was organized, I wrote to the father of American surgery, the late S. D. Gross, of Philadelphia, who wrote me that he would help in organizing the section. I wrote the resolution calling for the organization. It was presented to the Association at Richmond, Virginia, at the meeting in 1881 by Dr. Gross, seconded by N. S. Davis, and carried. The first meeting of the section was held in St. Paul, Minnesota, in 1882, just forty years ago. Meetings have been held every year, with one exception, since that time. Dr. Agnew, of Philadelphia, Dr. Toner, of Washington, Dr. N. S. Davis, of Chicago, and Dr. Austin Flint, of New York, all assisted in the organization of this section.

As to what the oral surgeon can do, I think the war brought out very fully his usefulness. As the essayist stated, they were not called oral surgeons, but dental surgeons—a department of the medical service under the direction of the surgeon-general's office. Colonel Wm. H. G. Logan was appointed to be the head of the dental department. They were not placed or known as oral surgeons; yet, in the city of Paris, before we were engaged in the war a demand existed for something they had not undertaken.

Dr. Morristin, of Val de Grace Hospital, Paris, who was regarded as the world's most famous plastic surgeon, operated on the heads and faces of wounded soldiers. In so doing he refused the services of dentists, especially with regard to facial prosthesis. He wanted nothing to do with dentists. He did his plastics as beautifully as anyone could do them, and what was the result? Instead of producing chins for his patients, which could only be correctly formed by the use of prosthesis, he found the patients were seriously deformed. They had parrot faces, with no chins. On the contrary, Pierre Sebilcau, professor of oral surgery in the École Dentaire de Paris, engaged the services of Georges Villain, professor of prosthetic dentistry in the same school. He constructed prosthesis to serve as a framework, over which the cheeks and upper part of the face, the nose, lips and chin were formed. His results were marvelous. Dr. Morristin learned that his results were not up to the high mark, that the features could not be restored without prosthesis. He therefore secured the co-operation of Dr. Frye, one of the greatest prosthetic dentists in France, and from that time on his results were better.

You will find today in the Val de Grace Hospital in Paris wax figures of restored features of patients, operated by Dr. Morristin, which are really beautiful. That is the kind of surgery that the soldiers in the late war needed. Again, Mrs. Ladd, who was well-known in Paris and in war hospitals generally, produced faces of metal, where the entire, or part of the face was gone. The face was made of aluminum and painted so that a soldier in walking along the street would hardly be observed as having anything wrong.

Occasionally we have to make a prosthesis to relieve the wounded soldier from disfigurement of his face, but war surgery is practically over. Certain plastic operations are now made for the purpose of overcoming and removing scar tissue, bone grafting and the like. Our schools should teach maxillo-facial surgery.

In support of what I have said regarding training in medical schools, I will say that medical schools have too much to do. They cannot enter into the discussion and teaching of other things or subjects on account of their extensive curricula, but there are a great many things taught in medical schools that had better be omitted—things that students forget in two years, and those things they come in contact with everyday they ought to know, but frequently they do not.

Medical and dental students should be taught the conditions of the body without excepting any part where disease has its origin. We all know that the mouth and teeth are ofttimes the centers of infection which manifests itself in parts quite remote. If the young practitioner does not understand the diseases of the teeth, if he does not understand how these diseases originate and induce diseases quite remote from the mouth; if he cannot make a correct diagnosis of dental diseases, how can he expect to treat a patient thus affected and secure good results?

The pendulum is swinging back. Formerly, when physicians believed the teeth were the cause of disease, they ordered their wholesale extraction. Patients have come to me from physicians who have ordered all their teeth extracted. In many of these cases it would have been a calamity to have extracted all the teeth for the relief of areas of infection that existed. What such patients needed was a dentist who knew how to treat the teeth and cure them without extraction.

I cannot too heartily indorse what Dr. Gilmer said on the question of the uncalled for extraction of teeth. I have in my office X-ray pictures of one patient who had all her teeth extracted posterior to the cuspids below and the first bicuspids above. At the same time, the alveolar processes were cut down to the point of exposing the mandibular canal, and above to the point of opening the antrum. The tuberosities were gone, leaving this girl who is only nineteen years old, with a mouth like a horse's mouth. The anterior teeth remain, but no teeth posterior to them; the alveolar processes and considerable bone beyond were

removed. That, she said to me, was the surgical extraction of teeth How can you extract teeth without doing it surgically? I do not see why anybody should have invented the term, "surgical extraction of teeth." When you take out teeth it is surgery; but there are those who take away the external plate and the alveolar processes with the teeth. The less they do of it, the better will be their professional standing and the better it will be for the patients. (Applause)

When I first heard the expression "granuloma" in connection with a tooth, I could not understand it. The great surgeon, the late William H. Vanburen, said: "A tumor is a local, limited enlargement taking place in any part of the body and consisting in its substance of new tissue which has no physiological purpose in its growth." A tumor will usually grow until removed, or until the patient's life comes to an end. That is the rule. Some continue to grow without creating any great disturbance. There is no such thing as a granuloma in a tooth socket. Does the condition of the tissues found in a tooth socket come under Dr. Vanburen's definition of a tumor? Certainly not. Where there is much suppuration in a part, the teeth should not be extracted but the pus drained off and if need be, the teeth extracted later.

Even the greatest medical schools of this country are paying very little attention to dental diseases and how can one feel for a moment that dentistry is a specialty of medicine in its broadest sense? I do not say these things to find fault, but I say it is a great misfortune to the people of our country that such conditions exist. Let us do our part in bettering the situation.

William H. G. Logan, Chicago, Illinois: The question has been raised, Why teach the dental student oral surgery when he is not legally authorized to perform many of the major oral surgery operations? From my viewpoint, there are many useful things that can and should be taught the dental student from the departments of dental and oral surgery. I have employed the term "dental and oral surgery" with the understanding that each has its limitations and those limitations may possibly be outlined as follows: the term "dental surgery" to include those diseases that need surgical interference that have their origin in the teeth and supporting structures, and are here confined to or by continuity involve the jaws; while the term "oral surgery" is meant to include not only the field of dental surgery but the management of all congenital and surgical lesions with which the face and jaws may be affected.

If one is to follow the above-mentioned definition of dental surgery the dentists would be held responsible for the diseases of the teeth, supporting structures, the associated bone and the tissues that become involved from disease spreading from the teeth. Therefore we should endeavor to teach the dental student the etiology, pathology, diagnosis and treatment of those diseases having their origin in and by continuity involving the teeth and the supporting structures beyond, for I believe he is within the proper limitation of his vocation when treating the medical or surgical lesions of this field. I believe you will all agree with me that the young man who is capable of caring for these lesions has a large field to engage his interests.

There is another subject that we should teach the dental student and that is the etiology and diagnosis of pre-cancerous lesions. The dentist should know more than the physician about these pre-cancerous lesions for the reason that he has the more frequent opportunity to observe mouth conditions.

During the twenty months that the United States was in war, we lost 80,000 of our troops from disease and injury, and during the same twenty months the United States lost by malignant disease about 130,000. Of that 130,000 we have reason to believe there was a pre-cancerous lesion in most if not all of these cases. Therefore let us make it one of our problems to teach the dental student how to diagnose a pre-cancerous lesion.

Dr. Gilmer has pointed out very forcibly that there are not many teeth that need to be surgically removed in the method that is now being applied. Dr. Brophy expressed the same opinion. When men of Dr. Gilmer's experience and of Dr. Brophy's experience make such a positive statement regarding this practice, it should carry great weight with the profession, because it is the experience gained in one-half a century by two of the greatest living oral surgeons of the entire world. (Applause) Therefore may I be permitted to urge you younger men not to be led afield and do that which you undoubtedly will regret in the near future. There is enough for the dentist to learn about the etiology, pathology, and diagnosis of the diseases of the supporting structures of the teeth, and in the field immediately beyond to engage his attention, so that one need not try to be a physician or surgeon, but should endeavor to be a dentist in the full meaning of the word, so that the patients who are intrusted to his care may be benefited by his services.

MOUTH CONTOUR CLEANSING

By HENRY BARNES, D.D.S., Cleveland, Ohio

(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

THE predominant thought in the mind of the profession today is how best to obtain a clean mouth, not merely brushing the teeth. This is so because of the recognized infections which are to be found in the body, whose inceptions lie within the human mouth. The known infections from this source are sufficiently numerous to cause alarm and the unknown are a source of constant doubt to the point of utter despair.

The various methods advanced to obtain a clean mouth are evidences of our thoughtful consideration of this subject. Cleanliness of the mouth and teeth is as essential to health as pure food, pure water, and pure air. What avail to insist upon pure food, water and air when we ourselves insure their contamination allowing meal after meal to pass without cleansing the teeth.

I have known many cases of restored health due to the habitual cleansing of the mouth and teeth following each meal. The effect of purified water on the health of the community is well known. Bridgeport, Connecticut, is said to have the lowest death rate of any city of its size of the United States. Bridgeport has a dentist who is striving to better the health of his community thru the medium of a clean mouth. It is also stated that in the army camps during the epidemic of influenza, the greatest percentage of mortality was among those who gave little or no care to the condition of the mouth.

It is not my purpose to claim for mouth cleansing every virtue, but I do know from my own experience during the past ten years, that the inferences to be drawn from the foregoing statements do not seem to be impossible of truth.

To those of you who are interested in the industrial field, this subject should be of the very first importance, because its practice will be followed by results so obvious that those whom you serve, tho of lowly station, will come to a greater appreciation of mouth cleansing, especially when they understand its relation to general health.

I know of no single health measure comparable to this in immediate appreciable beneficial results. Under absolutely normal conditions, brushing is unnecessary. (In normal environment animals neither use nor need the brush.) But our mode of life is abnormal and tends to produce a filthy condition of the mouth with resultant and associated ill health. Therefore we have been compelled to resort to artificial cleansing as a preventive and curative agent. Artificial cleansing has consisted of varied and indefinite toothbrushing methods which include the use of strong and mild chemicals, abrasives, floss silk, rubber bands, picks and various other agents. Included in this is the periodic treatment by the dentist and in the interim conscientious but actually abusive use of the foregoing agents by the patient.

Our idea of the necessity for artificial cleansing was and still is correct, but

our technic was faulty in that it destroyed tooth and gum contour.

Recognizing the variety of contours with which we have to deal and the fact that the function of dentistry may be said to be the conservation, restoration or imitation of natural contour with all that these imply. I have developed a brush technic which is quite in harmony with the function of dentistry as expressed. Hence the term contour cleansing.

Conservation of gum and tooth tissue is the act of keeping or protecting these tissues from loss or injury and is therefore the real function of dentistry. The dentistry of yesterday has been almost entirely a proposition of repair and substitution with but little or sporadic attempt at prevention. Here and there we have had those who have really tried to teach and practice prevention of decay, gum disease, and loss of tooth function.

The failure of artificial cleansing by both patient and general dentist has already led to the establishment of a new dental specialty, prophylaxis, which aims to conserve dental tissue by careful instrumentation periodically applied and supplemented by ad interim co-operation of the patient. In the treatment of calcareous deposits, gingivitis, spongy gums and pyorrhea, from Dr. Riggs to Dr. Smith and to the present, the practice has been and is mechanical cleansing in spite of the theory of systemic origin.

The restoration of contours in fillings, inlays, crowns and artificial teeth and the regulation of teeth are factors in the conservation of teeth and gum tissue in that during the process of mastication they provide for the protection of gingival margins, the proper shedding of food and the necessary stimulation and massage of the gums, particularly the gingival and septal tissue.

The conservation of dental structures is demonstrated in normal occlusions noted in the dental examination of Italian children at Murray Hill School, Cleveland; 7 per cent had normal occlusion with perfect teeth and gums; 35 per cent had practically perfect occlusion and perfect teeth and gums. Very few of them had used a toothbrush; they apparently did not need to. All other schools had only 3 per cent perfect and many of these used toothbrushes. These percentages emphasize the value of regular teeth.

The success of any prophylactic treatment is very largely due to the co-operation of the patient. The patient often has co-operated to the best of his ability under the instructions given, but these instructions have been faulty.

Vigorous brushing or scrubbing in any direction or by any method, the habitual use of tooth powders and chemical mouth washes, large and stiff brushes, floss silk, rubber bands and toothpicks have all been advocated by dentists and all of them have caused more or less serious injury to teeth and gums. Brushing methods as advised by the dentists have been wrong in principle and destructive in practice. The use of cleansing agents has been advocated generally without definite instruction as to their use and without a knowledge of the evils which might result from their use.

In June, 1902, at a meeting of a Northern Ohio Dental Association at Cleveland, I read a paper entitled: "Some Facts and Conclusions Regarding Erosion." This was published in the *Dental Summary* in October, 1902. The paper was illustrated with casts which showed abrasions and what was then thought to be abrasive erosions which were due to or aggravated by the use of brush and tooth powder.

W. D. Miller of Berlin, concludes that "the wasting of the teeth is for the most part a purely mechanical process (abrasion) in which the chief and often only factor concerned is the toothbrush in conjunction with tooth powder."

While continuing the investigations

of injuries to the teeth from the use of brush and frictional powders, my attention was attracted by injuries to the gums which were co-ordinate with those of the teeth. A careful study of these lesions strengthened the belief that they were mechanically produced; and later this belief in conjunction with the findings of Miller was accepted as fact. Efforts were put forth to correct the in-

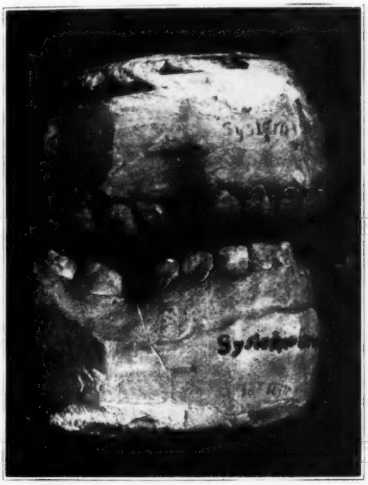


Fig. 1.—Condition of patient twenty-five years ago. See Fig. 7 for present condition.

juries using various methods of brushing but with indifferent success. Finally, in the summer of 1911 a new brush method was thought out and in September of that same year experiments in its use were commenced.

I noted that all the popular methods employed in the brushing of the teeth when in use produced injuries to the gingivae. The hand grasp of the brush and pressure under vigorous muscular tension, scrubbing and brushing to and fro, up and down, circular and rotary, force the gingivae from their normal cervical constriction, inducing gingivitis. Then food lodged underneath the lacerated and inflamed gums and on being forced between teeth and gums caused spongy gums. Later pockets developed and ultimately pyorrhea was established.

The prophylaxis treatment given by the dentist was often of little avail because the patient by his faulty irritating brushing methods was daily forcing debris into these brush-formed receptacles. Under the heat of the body this debris changed to a mass of filth and became the pabulum for the propagation

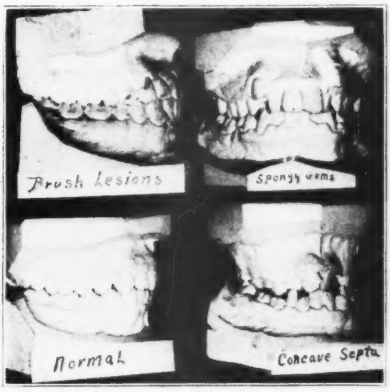


Fig. 2.

and growth of disease-producing bacteria.

It was evident that brush bristles acting on surfaces at right angles to the long axes of the teeth could not equally cleanse oil contour surfaces, and the larger the brush and the stiffer the bristle, the lesser the efficiency and the greater the injury to gums and teeth.

Forcing the bristles into the interdental spaces at right angles to the long axes of the teeth will cause the gums to be flattened on their interdental apices. These gums will have the appearance of health but will not afford the natural contour to deflect the food during the act of mastication. It is a fact that the gums in health or disease reflect the method of brushing modified

by systemic conditions, the stiffness of bristle, size of brush and the vigor with which the method is applied.

If the gums by incorrect methods can be forced from their natural constriction about the cervical margins then it follows that they may be correct methods be made to form about these cervical margins as nature intended but modified by the loss of the underlying structure.

The realization of this fact noted some twenty years ago is the basis for my work and the result of which is

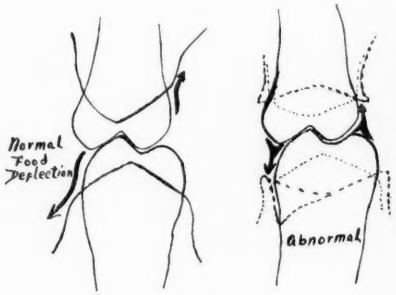


Fig. 3.

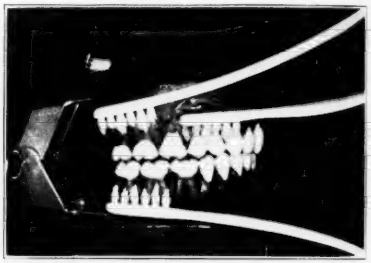


Fig. 4.—Bristles entering interproximal space at an angle of about 30°.

stated in the several papers written and published to date.

Contour brushing expresses the idea of the necessity and possibility of efficiently and mechanically cleansing all the approachable concave and convex surfaces of the mouth mucosa, teeth and tongue.

Interdental Brushing

Interdental brushing is a limited term and applies only to the interdental spaces, whereas contour means this and much more.

The chief object of this effort is to clearly call attention to and record a new and definite process of conservation which shall be taught by the dentist and practiced by the patient. This process is a new method of using the toothbrush so that it positively will conserve the dental tissues and eventually the health. The method can be applied fairly well with small brushes now on the market, but the application will be markedly better with a modification of these brushes. These will be considered later.

We recognize the injuries caused by faulty fillings, inlays, bridges, crowns and artificial dentures but the specific object of this paper is to call attention to the injuries inflicted upon gum and tooth tissues by faulty toothbrush technic and to suggest a remedy therefore.

In 1911 when the softened bristles were carefully forced into the interdental spaces an immediate and astounding discovery was made. The abrasion, chemical so called, was controlled; gingivitis disappeared as if by magic, spongy gums were rapidly healed and pyorrhea responded to treatment as never before.

Let it be clearly understood that from 1911 to 1914 comparatively large brushes were used, but notwithstanding these imperfect tools, marvelous results were obtained. About the year 1914 smaller brushes were used, and as the size of the brush decreased, the efficiency of the method was increased, so that from that time to date the very small brush has been used.

The Brushes

Three brushes are advised for contour brushing: One comparatively

small brush of compact clusters, of soft bristles for cleansing the tongue and mouth and the mucosa contours. Another brush with one row of well spaced alternating long and short clusters for labial and buccal cleansing. Another of two or more converging rows of stiff bristles, the back member bent so that the bristles practically parallel the handle, and the end of the handle curved to facilitate holding while brushing the lingual contours.

There may arise an objection to three brushes, but if we are to thoroly cleanse all the approachable contours of the mucosa and teeth, we must have adaptable tools for the work. The fact that only one brush has heretofore been used for brushing should not prevent our adoption of suitable tools for the more perfect cleansing of the mouth contours. As dentists we demand separate instruments with their peculiar curves and angles to properly perform our work, but we seem to have been satisfied with our any old size or form of toothbrush. Experience has demonstrated their value and necessity.

These brushes, kept in water between brushing periods and used with hot water will have their bristles softened and be in the best condition for service.

The small brush with the single row of bristles is used because experience has fully demonstrated that one row is sufficient and more efficient than two or more rows. The small single row narrow back brush used with a shaving stroke, with a rocking tilting or wiggling action gives a massaging range and a freedom of action without muscular tension which is impossible with larger brushes.

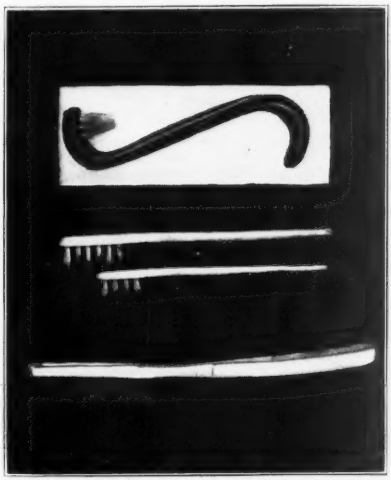


Fig. 5.—Labial, lingual and buccal brushes.

Care of the Brush

A new brush should always be soaked in water over night so that the bristles will be pliable. After using, the brush should be well washed and may be filled with a pure soap or placed in a glass of water until the next using. When the soap is washed out with warm water the bristles will be clean and pliable.

We are speaking of softened stiff bristles, *not soft* bristles.

Contour Brushing

Take the brush, kept in water or soap water, and soften in hot water. Hot water is preferable as it will be needed to clean the brush during and after each brushing. Do not dip the brush into a glass of water because you are then trying to cleanse the mouth with its own debris.

A pivotal hold is made with the tips of forefinger on handle close to bristles, other fingers acting as guides, motors and brakes. For a right-handed person, the left side is brushed with a brush held as tho it were a pen or pencil. The bristles point down on upper arch and up on lower arch.

To brush the left side the brush is turned in the pivotal fingers and brought around so that it occupies a position 80° from that of the pen hold, bristles pointing toward you.

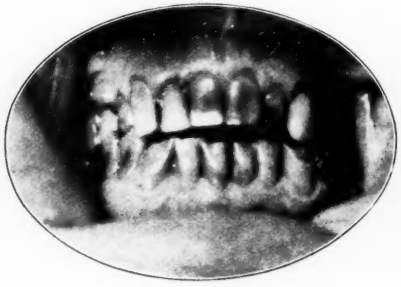
Lay the side of the brush high on the upper gum and incline to an angle of about 30° with the gum. Then with an arm and shoulder motion, stroke down and in with a little more pressure and also with a jiggle to thoroly cleanse all contours.

For brushing the lower gums and teeth the position of the brush is reversed, the bristles point up.

The lingual brush is used by holding the curved end of the handle between the tips of thumb and forefinger and by an up and down action upon the gums. This will cleanse all the lingual contours. This may be compared to a raking action except that the bristles parallel the handle. The brush may be of one row of bristles or of two rows which converge at their ends.

The motion of all brushing should be comparatively slow to give the bristles time to flex and follow contours from gum to tooth and interdental contour. The slow flexibility of the bristle into the interdental spaces with slight additional pressure down, in, thru and back repeatedly has been well expressed by Dr. Hartzell with the term "jiggle." I have used and taught this action since 1911.

The characteristic position of teeth and their spaces is vertical. Therefore, the essential position and stroke of the bristles to produce the proper action of the brush must be vertical. There also must be such a brushhold as will permit a compensating action of the brush, hand and wrist to follow the contour of the dental arch, as a swivel. This



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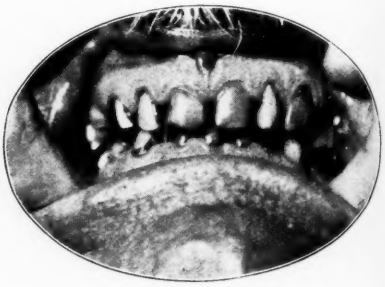

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Figs. 6 and 7.—Fig. 6, case of abrasion showing no appreciable wear during the last two years that the new method has been used. Fig. 7, extensive abrasion restored by filling; no wear during last ten years. Both patients, sixty years of age.

brushhold must be flexible, not rigid. The brush should be held by the thumb and finger tips, not in the palm of the hand.

In all the brushing, the bristles do not leave the surface but chisel down and slide up on the upper jaw and chisel up and slide down on the lower jaw. The bristles sliding back have only a gentle massaging effect without injury to tissue, soft or hard.

The brush should be rinsed frequently in running hot water to cleanse, and

Fig. 8.—Pyorrhea case; effect on gums in ten days with the new method of brushing.

bearable hot water should be used to squiggle within the mouth to dislodge small particles of debris picked out in brushing.

It is an excellent habit frequently during the day to squiggle warm water in the mouth to dilute vicious fluids therein and prevent placque formation. In addition to brushing, I advise a squeegee thumb and finger tip massage for pyorrhea, and brush squeegeeing of the gingiva and gum septa for elimination of debris from the free margin of the gums.

Time For Brushing

The injuries to the soft tissues have been considered mainly for the reason that the teeth in the performance and maintenance of their natural function must be surrounded with the healthy gum tissue. This gum tissue in a healthy condition conserves the hard tissue not only of the teeth, but of the alveolar process. It is well at this point to note that the sides of the bristles in brushing also act upon the gum tissue to massage and give it natural form.

Short Gums

When the gums are short and the frenum high, the small soft bristle brush of two or more rows is recommended. The rolling method should be used to massage the gum followed by the one-row bristle brush to cleanse the spaces.

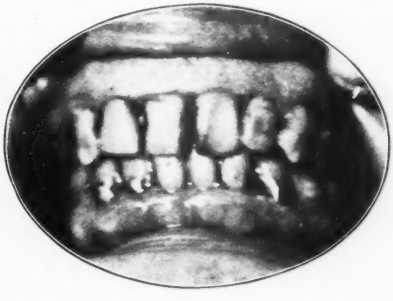

Fig. 9.—Extensive pyorrhea; case has had fourteen days' treatment.

Obviously, very irregular teeth will require a little modification from the action used where regularity exists.

The gums will form themselves about the teeth in the direction of the pressure applied by the brush in the act of cleansing. Extreme pressures are to be avoided if natural approximation of gum restoration is desired. In all brushing the bristles act as a gum and tooth cleanser and as a gum massage when the gentle working stroke is from the region of the apices to the occlusal surfaces.

In the return stroke the bristles do not lose contact with the tissues. They

slide back mesio-obliquely to the apical position without any other action but that of a gentle massage. The brush bristles laid lengthwise upon the gum and drawn or shaved over them have by reason of their flexibility due to the warm water or soap treatment a compensating action which massages and cleanses every surface over which they pass or act without injury.

Prophylaxis

A monthly scaling and polishing of the teeth by the dentist combined with the use of chemicals and abrasives creates in the mind of the patient a false sense of security which minimizes the importance of their personal care. They regard this treatment as curative.

On the other hand sixty to ninety mild personal treatments by the patient himself magnifies the importance of personal care and is really preventive as well as curative.

The dentist should do only those things that the patient cannot do for himself. He should be instructor and examiner. The patient should be the student taught by the instructor how to take proper care of the mouth, graduating from this supervision only when he has become personally and thoroly efficient.

The dentist to best instruct patients must himself have a definite and positive method for instruction. This does not necessarily mean that he shall confine his instruction to any single method for all cases and for all locations in the same mouth. It does mean that he must study each case and apply the brushing technic to that case. He must recognize peculiar conditions in various locations in that mouth which may call for a modified technic. He must remember that he is teaching mouth cleansing, not tooth brushing.

The shaving action, the limply held very small brush and softened bristles produce a gentle stimulating message of the gum tissues and the cleansing of gum and tooth surfaces without irritation or observable tooth abrasion. Squeegeeing of the gingivae stimulates without irritation and hastens the return to and the final re-establishment of normal functions which is evidenced by the pale pink gum tissue, the firm constriction of gingiva about the teeth, the convex gum septa, the natural gum festoon and the singular cleanliness of the gingival margins and the interproximal spaces.

Gingival Pyorrhea

Gingival pyorrhea is that pyorrhea which commences with gingivitis followed by spongy gums and finally pockets within the alveoli. This may be caused by non-brushing, faulty brushing, malocclusion or other injuries influenced by dire and systemic conditions.

Filth is a prolific cause of pyorrhea. T. B. Hartzell has very appropriately called this filth bacterial filth or mold. Pyorrhea is impossible in a mouth cleansed by the method as given. Pyorrhea already existing will in many cases be eliminated provided the method is persistently followed.

Cleanliness is its prevention, control, and cure and this includes any other operation that may be necessary. Squeegee finger tip massage in addition to the warm water and tooth brush is used for the treatment of pyorrhea. This is performed by placing the tip of the thumb and finger, one on either side of the teeth, over the apical region, then drawing them downward to the occlusal surface.

The primal cause of pyorrhea is injury to the gingiva of the gum septa. The immediate cause thereof is filth often due to the thrice daily forcing of debris underneath the gum and into the pocket, there to remain until it becomes a mass of filthy garbage.

Cumulative Injuries

The toothbrush improperly used is cumulatively aggravating to injuries inflicted by it and to injuries already existing, due to other causes. Rightly used it is also cumulatively benign in its good effects greatly modifying the injuries due to other causes. This declaration is the result of observation of cases in practice where the improper use of the toothbrush has been employed and of the almost miraculous change resulting when the new method was substituted.

From the experience of the past ten years the writer is assured that injury to the gingiva due to other causes are of less importance than of those inflicted by the toothbrush. The brush properly used greatly modifies the severity of these injuries and minimizes their ill affects. When these injuries are eliminated and the brush properly used there is a most surprising restoration of the gum tissue to health.

It will have been noted that this new toothbrush technic does not require the use of antiseptics germicides or frictional agents other than the toothbrush and hot water. The results obtained seem to show that the mouths and teeth of those patients who use no other frictional agent than the brush present a cleaner and more healthy appearance than do those using the technic of chemical and frictional agents.

Instrumentation is a necessary adjunct to the treatment but it is not advisable to make it more than superficial until the stimulating affect of the technic is obtained. From time to time as the tissues become more normal, instrumentation may be continued to completion.

The brushing will first clear up the superficial affects and reveal the greater regions which will then receive instrumentation or other operative treatments.

I quote from Dr. Osler in conclusion: "Man has now control of the most malign of nature's forces in a way never dreamed of by our fathers. A study of her laws and observation of her facts often a very simple fact has put us in possession of life saving power nothing short of miraculous."

The old proverbs teach that filth leaves disease and that cleanliness is next to godliness.

I am indebted to Varney E. Barnes for the term "contour" which so adequately and comprehensively describes the method.

PREVENTION IN DENTAL PRACTICE

By ARTHUR H. MERRITT, D.D.S., New York City

(Read before the Michigan State Dental Society, Ann Arbor, Michigan, April 4-7, 1922)

IT WAS only a few years ago that one of the most distinguished surgeons of the country made the prophecy that the next great step in preventive medicine would be taken by dentistry. This prophecy was doubtless made in recognition of the tremendous possibilities for such a contribution in observing, thru the opportunites afforded by an unique hospital experience, the far-reaching consequences of dental diseases, affecting not only the teeth and adjacent tisues but in many instances the general health also.

It is the universality of such diseases which make of them a serious problem, when the public health is considered. Where one person requires the services of the surgeon, a thousand require those of the dentist. Where a few suffer from diseases of the eye, ear, nose, or throat, a multitude suffer from disease of the mouth and teeth. It is this very fact which gives to dentistry its pre-eminence as a potentially fertile field in preventive medicine. No race completely escapes the potentially serious consequences of dental caries and periodontal disease.

But has anyone of the thousands who must have been inspired by the prophecy, ever seriously considered how it was to find fulfilment—ever asked himself, What must dentistry do to make this prophecy a reality? This is a serious question. It concerns the health and well-being of uncounted millions of people. If the truth were known it would be found that much of the ill health and inefficiency of life have their origin in unclean and unhealthy mouths. What has dentsitry done and what is it doing to measure up to its responsibilities, to hasten the fulfilment of this prophecy? This question must be answered before it can hope to take its rightful place in the healing arts.

It is only a little more than three-quarters of a century since organized dentistry had its birth, a little more than the alloted span of man's life. It was born in response to a great need, tho the greatness of the need and the part which it was destined to play in conserving the health and well-being of humanity was not generally recognized. These early pioneers in dentistry built better than they knew. They began as an independent profession, with no tradition to guide them and with no literature to be a light to their feet. It was inevitable that false lights should arise and that mistakes should be made. Notwithstanding this, however, its progress has been rapid. It has evolved a restorative technic which has made American dentistry a synonym for excellence thruout the civilized world. At its best, it may almost be said to have reached the acme of perfection; little more can be expected or is needed in this direction.

Yet if we pause long enough to make an inventory of the situation, it will be found that these accomplishments of dentistry, splendid tho they are, have not materially checked the incidence of dental caries or those lesions affecting the supporting tissues of the teeth.

If any one doubts this, let him survey the present-day field of dental practice.

Let him take cognizance of the vast multitude of pulpless teeth with all their unfortunate sequelae, which have their origin in dental caries, and which reparative dentistry has been impotent to prevent. Let him observe the condition of the investing tissues of the teeth as seen in the mouth of the average adult, and note the number of those in whom these tissues are already involved in disease—a disease attended by a chronic suppurative infection which will eventuate in the loss of the teeth, not to mention its influence meanwhile upon the general health. It will be agreed that these things ought not to be, that however splendid the achievements of modern dentistry, they have in a measure failed; that the next great step in preventive medicine cannot be taken thru dependence upon dental art, no matter how perfected it may become. It will be obvious to the impartial observer that some means must be found for preventing, rather than repairing the ravages of dental diseases, that dentistry can never enter into its birthright until it has subordinated reparative to preventive dentistry.

One of the obstacles to preventive dentistry has been the attitude toward it of the members of the dental profession. They have really never given it a trial. It is not that they have been antagonistic; they have not as a profession thought of it at all. So intent have they become in the restorative side of their work that they have unconsciously made it an end in itself, instead of making it, as they should have done, a means to an end. They have always thought of dentistry as an art, have been trained in their undergraduate days to so regard it, and have too often entered upon its practice with no other thought concerning it. The idea of prevention plays no part in the background of their experience, and has little or no place in their daily practice. He has been acclaimed the most skilful whose art was the most perfect. And yet, in the last analysis, restorative dentistry will always be representive of dentistry's defeat. Its very existence is a confession of having failed in that highest of services in the healing art, that of prevention.

The two main streams of oral focal infection have their origin in dental caries and periodontal disease. If these could be effectually stopped at their source or even reduced to a minimum its effect upon the public health would be incalculable. D. D. Smith made the statement more than a score of years ago that there was no one thing that would so raise the standard of national health as sound teeth and clean mouths. And in Osler's opinion national intemperance is less disastrous in its effect upon the public health than is that of uncleanliness of the mouth and teeth.

If now one considers dental caries and its causes with a view to prevention, it will be found that it is dependent for its initiation and progress upon two factors, susceptibility and bacterial activity. Eliminate either and dental caries ceases. Of these two, susceptibility is the predominating factor. It would seem to have its roots in some nutritional abnormality in which calcium deficiency plays an important part. It is a condition transmissible from parent to offspring.

Every dentist has observed this susceptibility in varying degrees in different individuals; has had under treatment cases in which it was so marked that tho he exhausted the resources of reparative dentistry he made almost no headway against it. Of the two factors in the etiology of dental caries, it is the more subtle and the more difficult to control, tho obviously the more important. For if it could be controlled, dental caries would be eliminated in a few generations.

Of the part played by bacteria, more is known. Their presence in the mouth is necessary to the initiation of caries; without them the most susceptible would be immune. It is also necessary that they attach themselves to the surface of a tooth and remain there for a considerable period of time, protected by a gelatinous-like plaque in order to affect their

solvent action. Even then, their activity will depend upon the measure of susceptibility of the individual. Every one is familiar with the insanitary mouth in which caries never develop owing to the absence of susceptibility, clearly showing the impotency of either of themselves to bring about dental caries.

In the prevention of dental caries, there are, then, two points of attack, one thru controlling as as far as possible the forces which make for susceptibility, the other by limiting the number and activity of the oral bacteria. The logical point of attack would be to ascertain and remove those factors which make for susceptibility, for could this be done the problem would be largely solved. Unfortunately, very little of a practical nature is known regarding them. Accumulating evidence points to calcium deficiency as the underlying cause, which can in a measure be controlled thru diet. One should inquire into the diet of susceptible individuals, especially children, and recommend a diet rich in calcium, which should include milk, eggs, butter, whole wheat bread, etc. In certain cases it may be desirable to prescribe calcium in an assimilable form. Russell's Prepared Green Bone made from the bones of month-old chickens is a preparation of this kind, and has been found useful in the treatment of calcium deficiency in tubercular patients. Pastries and sugars should be reduced to a minimum or eliminated altogether.

The prevention and limitation of dental caries thru its bacterial factor has been the usual mode of attack, and when intelligently employed will abundantly reward the effort. This means the observation of oral hygiene in its broadest sense, which implies not only the cleansing of the teeth but such care of the mouth as a whole as to maintain it in perfect health. Cleanliness is the first requisite. In this the dentist must take the lead, thoroly cleansing the teeth in the first instance and at stated intervals thereafter, and, more important than this, teach the patient how to properly cleanse and care for his own mouth and teeth. It is essential that the intelligent co-operation of the patient be obtained, for the most careful monthly treatments by the dentist will avail little if in the interval the teeth are not kept clean by the patient. It means also the preparation of every carious cavity in such a way as to prevent as far as possible recurrent caries; the careful scrutiny of erupting teeth to protect deep fissures against early decay; the judicious use of silver nitrate; the polishing of etched and roughened enamel surfaces, etc. In a word, making prevention the goal in every dental operation.

Think for a moment of what this would mean—the practical elimination of the pulpless tooth with all it means as a source of focal infection; relatively little tooth extraction; marked limitation in all forms of prosthesis; preservation of normal contact points, and making toothache only an unpleasant memory of the past. These are some of the things that can actually be accomplished in everyday practice when once the ideal of prevention has taken possession of one.

The prevention of periodontal diseases is far more easily accomplished than is the prevention of dental caries. Their causes are divisible into two groups which for convenience sake may be designated primary and secondary. The primary causes are those which occur within the mouth itself and always take the form of a mechanical irritant. These again are subdivided into two groups, those which affect the gingivae, chief of which is uncleanliness of the mouth, and those which affect the deeper periodontal tissues, such as traumatic occlusion. The secondary causes include nutritional disturbances, chemical irritants, bacterial intoxication, predisposing local conditions, such as frail osseous support, tooth form, etc. Prevention should be directed toward the elimination of the primary causes, since they are always the inaugurating causes. Oral hygiene is a most effective instrument to that end, for if properly em-

ployed it will greatly limit the chiefest of these, which is irritation of the free gingivae. Mouth cleanliness, plus such attention to the occlusion as may be necessary to insure against trauma, will probably prevent more than 90 per cent of the diseases affecting the periodontium and included under the general term of pyorrhea alveolaris. To realize what that implies one has only to make a careful examination of the mouths of a large number of adult patients who have all their lives been more or less regular patrons of the dentist, and observe how few among them present with a perfectly healthy periodontium, by which is meant gingiva, pericementum and alveolar process. And, be it remembered, these are cases which have developed while under the regular care of the dentist, literally before his very eyes. Here is dentistry's greatest failure. It has placed its dependence upon dental art, and in the prevention and treatment of dental caries it has achieved a measure of success.

But dental art is not applicable to the prevention and treatment of diseases of the periodontium, and because it is not dentistry has more or less failed in its care of these cases. How many times is beautiful restorative work done upon teeth, the supporting tissues of which are already involved in disease, and the patient dismissed without anything effectively having been done to arrest a condition which will eventuate in the loss of both tooth and restoration. These things ought not to be, and will not be, when dentistry takes its rightful place in preventive medicine.

If then the fulfilment of the prophecy can come only thru preventive dentistry (and it will probably be agreed that this is true) what steps should be taken to put it into effect, to make of dentistry what it ought to be, one of the greatest forces for good among all the agencies making for better health. The first step in this direction is the education of the members of the dental profession. They should not only be taught the best means to that end which are at present available, but they should be made to feel its exceeding value as compared with the highest expressions of dental art. This will mean a change in our ideals regarding dental practice. That individual must be reckoned the most skilful who most successfully prevents the development of diseases within his chosen field. This in no way detracts from the skilful operator, for skill in operative technic is absolutely essential to the highest success in preventive dentistry. It is simply subordinating reparative dentistry to its rightful place, making it to be the servant and not the master in dental practice. This education must be begun in our dental schools by holding the ideal of preventive dentistry before the student from the day he enters upon his studies to that of his graduation. Every teacher in the school should emphasize it as it applies to his special field. More than this, every school should establish a chair to be known as the chair of preventive dentistry, the sole duty of whose encumbent it shall be to instruct the undergraduate in every detail which makes for prevention in daily practice. In addition, the student should be taught in the college infirmary to put into practice the instructions of the classroom. In this way only can instruction and practice be related to each other and the student made to realize by concrete example what can actually be accomplished in the field of prevention as it applies to dental practice.

This would take care of dentistry at its source which is of first importance, but it would postpone for a generation the rich rewards of preventive dentistry if one were to stop there. Some means must be found for postgraduate instruction, and this is the second step. The rank and file of the profession as it already exists must be inspired with the vison of prevention as it applies to daily practice. And I know of no better way in which to do this than that undertaken by the dental profession of the state of Michigan. So far as my knowledge goes, the

dentists of Michigan have done more for preventive dentistry than any other group of dentists in the United States. The Detroit Dental Clinic Club gives the most comprehensive postgraduate course in preventive dentistry of which I know. In fact I know of no similar course given by any one anywhere. For the first time in the history of American dentistry, a state dental society has had the courage and vision to devote one entire day of its program to preventive dentistry.

A similar work should be undertaken by every state dental society in the country. By lectures and by clinics, the lessons of preventive dentistry should be brought home to every member of the dental profession, not only in this country but in every country. Let those in the forefront in this movement organize themselves into groups to that end. And lastly, having availed ourselves of all that present-day knowledge has to offer, let there be no abatement in our interest in scientific research. We have but touched the hem of the garment of prevention as it applies to dental practice. Before us is a vast region of unexplored possibilities. Think for a moment of what it would mean to discover something of the forces which make for susceptibility in dental caries; of the solvent action of bacteria on enamel surfaces, and what it is that makes for or against the development of periodontal diseases. Few of us have the capacity or training for the exacting duties of the research worker, but there is no one among us who cannot in some way contribute to the advancement of scientific research.

Years ago I heard Safford G. Perry, one of the most refined and cultured men whom it was ever my privilege to know, say, that he would rather be a dentist than anything else in life, "for," said he, "I hold that the prevention and relief of human suffering is the highest service to which one can give himself. Did not the Master, by example, teach the same thing? And," he continued, "to the dentist, even more than to the physician or surgeon, is given this greatest of opportunities to serve, for every act of his professional life has for its end the prevention or relief of pain." And he might here have added, and the greater of these is prevention.

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WAX PATTERNS FOR CAST GOLD INLAYS

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(Read before the National Dental Association, Milwaukee, Wisconsin, August 15-19, 1921)

GIVEN a properly prepared cavity the next important step in the manufacture of a satisfactory gold inlay is the making and handling of a perfect wax pattern. Many faulty inlays are directly traceable to imperfect wax patterns. This imperfection may occur during the manipulation of the wax in the mouth or after the pattern has been removed and before the investment has thoroly hardened. It is the purpose of this paper therefore to discuss in more or less detail some of the principles underlying a technic of making perfect wax patterns.

Waxes

A large variety of waxes which are suitable for use in the casting process are found upon the market. Each brand of wax has its own advocates, due to some qualities which appeal to the individual operator, yet each wax exhibits to some degree a group of physical properties common to all recognized inlay waxes. These common or basic characteristics are of the most interest to the operator because the recognition and treatment of these characteristics determine to a very large degree the perfection and stability of the wax pattern.

All inlay waxes expand on heating and contract on cooling. Various types of wax show different amounts of movement under a given degree of heat. Much has been written concerning the effect of removing a wax pattern from mouth to room temperature or of chilling to facilitate such removal. The so-called "expanded wax pattern" is advocated by some to overcome this contraction of the wax, and in addition to compensate for the shrinkage of gold when it cools in the mold. If the coefficient of expansion of the particular wax used were known, and if wax patterns were of uniform dimension it would not be difficult to cause proper adjustments, because theoretically the contraction is equal to the expansion and vice versa. But most inlay patterns have a very irregular distribution of the wax and therefore the resultant of the expansion and the contraction is a permanent warpage of the pattern.

All waxes are elastic. Some waxes are brittle at room temperature but show elasticity when warmed. The elasticity is noticeable when the force is removed after bending or compressing. Then the wax has a tendency to assume its original form. The elasticity movement is much slower, and less in amount, if the force is maintained until the wax reaches a given temperature, such as room or mouth temperature. A so called "elasticity lock" is established. This elasticity may also be locked by the application of cold while the wax is under strain. However, in both these cases a rise in temperature will release the "elasticity lock"

and accelerated movement will occur. The more extreme the temperature change the more rapid and extensive the movement. The only practical method, therefore, of dealing with the elasticity of wax is to attempt to minimize or dissipate it. The elasticity may be practically dissipated by the application of sufficient heat to permit the molecules of wax to rearrange themselves and become fixed while the wax is under more or less continuous pressure. To accomplish

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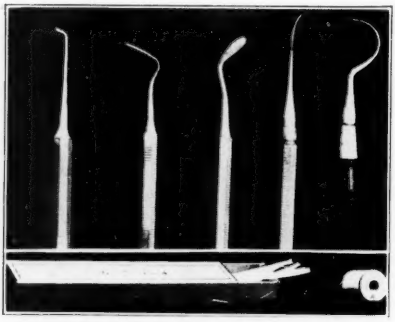

2

Figs. 1 and 2

this result some operators use an instrument that has been sufficiently warmed to melt its way thru the wax, after its initial adaptation. The melting of the wax causes, first, some degree of expansion and later a similar contraction, but only a slight amount of manipulation is necessary in order to correct the adaptation. The areas of strain developed during the secondary adaptation are so small and so widely distributed that their effect is negligible. I feel that the elasticity is effectually dissipated by bathing the wax pattern with a liberal amount of water at 110° to 115° F. The details of its use will be described later.

As previously stated there are many types of inlay wax upon the market and each brand has its advocates, usually because of some minor quality, such as color, melting-point, hardness, brittleness, ease of carving and of welding, that appeals to the individual operator. But regardless of these qualities, which are purely minor, good patterns are made from a standard casting wax only when the operator recognizes and successfully treats the fundamental physical characteristics common to all waxes, namely, expansion, contraction, and elasticity. Therefore any good grade of inlay wax is sufficient; the important consideration is that the operator become familiar with its working qualities.

Instruments

Only a very limited assortment of instruments are necessary. Each operator has his "pet" instruments. Figure 1 shows the group I prefer because they seem to be particularly well adapted to follow out the principles of technic I advocate. S. U. I. No. 2 is used to establish the occlusal planes of wax patterns, and to burnish and rub wax to the margins at other locations where the instrument fits. Ward's Wax Carver is a general carving instrument, especially useful in removing large excesses and spatulating or rubbing the wax to the margin. Explorer tines Nos. 2 and 23 are useful in trimming wax to the margins, especially in the interproximal space. The sewing silk, A, is used to pass between the wax pattern and the adjacent tooth in order to free the contact point (Fig. 2). If the silk thread is held tense it will cut wax freely without any particular drag upon the wax. Because of this fact it can be made to assist in removing the surplus wax in the interproximal space by sweeping it in an occluso-gingival or an inciso-gingival direction taking off a thin shaving at each sweep.

The tracing cloth strips are used to polish the wax pattern in the proximal portion. Fram's carvers are useful occasionally in carving the occlusal surface of a wax pattern, and are good additions to an instrumentarium. The water at 110° or 115° F. and the syringe are used to bathe the wax pattern in an effort to dissipate the elasticity of the wax (Fig. 3).

Fig. 3

Making the Pattern

The making of a pattern for a mesio-occlusal cavity in an upper second bicuspid will illustrate the technic used on all proximo-occlusal patterns (Fig. 4). A liberal piece of wax should be selected and the end gradually warmed by rotating it *over* a flame. As the end softens it is molded in a point sufficiently fine to pass freely between the teeth and reach the gingival wall of the cavity—the most unaccessible portion of this type of cavity

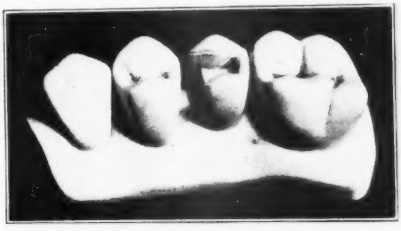

Fig. 4

(Fig. 5). During the warming of the end of the wax some heat will have passed back into the wax so that the op-

posite end is only slightly plastic. The fine, softened point of the wax is passed between the teeth and the whole mass is forced and pressed gingivally (Fig. 6). The firmer end of the cone acts as a

Fig. 5

plunger and forces the softened end of the wax tightly home to the gingival. The excess which is forced into the proximal portion of the cavity will tend to squeeze out buccally and lingually. The excess on the occlusal portion will push out and fill the occlusal portion of the cavity and spread over the occlusal surface of the tooth. The thumb and finger of the left hand can be used as a matrix on the buccal and lingual and thus hold the wax in the embrasure, and at the same time the thumb or finger of the right hand, or a good-sized ball instrument can be used to force the wax into the occlusal opening of the cavity.

Such manipulation is continued until the wax ceases to move under pressure, when it should be bathed with several syringes of warm water from 110° to 115° F. The patient is then asked to close, not grind, the teeth. The closing of the teeth has a tendency to accomplish the results, first to force the wax still tighter into the cavity, if possible, and second to indicate the location of the prominent opposing cusps. Next, the wax is again bathed with warm water and molded down with the thumb and fingers. A repetition of the biting and readjusting may be necessary in some cases. The establishment of the occlusal plane of the pattern is the next step (Fig. 7). This is easily accomplished by S. U. I. No. 2 used as a burnisher. The edge of the working point should be made to follow the direction of the intended grooves and fissures, thus permitting the side of the working point to shape the inclines of the cusps and ridges. The burnishing or rubbing perfectly adapts the wax to the margins and also cuts it off flush with the margins. With

Fig. 6

Fig. 7

Ward's carver the embrasures are roughly trimmed out and if possible some of the excess wax in the interproximal space is removed. No attempt is ever made to *cut* the wax flush with the margins. It has been my experience in attempting to

cut the wax flush with the margin, by carrying the blade of even the finest edged instrument in a direction parallel with the margin, that the elasticity of the wax permits it to feed out upon the blade as it moves forward, so that, when the blade has passed, it contracts back into the cavity. Under such conditions, when the inlay is cast and tried in the cavity it was found that a fine enamel margin stands up above the inlay. Therefore an attempt is made when carving with a blade instrument to leave a small excess of wax above the margin and this excess is finally worked away by rubbing, burnishing, and polishing. The explorer tines are next used in an effort to remove the excess of wax in the interproximal space. In many cases the entire proximal surface of the wax pattern can be perfectly shaped with these instruments. During the process, the wax along the buccal and lingual margins can be burnished and trimmed to flush contour. A piece of "A" silk thread is now carried thru the contact, and any remaining wax in the interproximal space can be shaved away. Next a tracing cloth strip is carried into the interproximal space and the final polishing is done (Fig. 8).

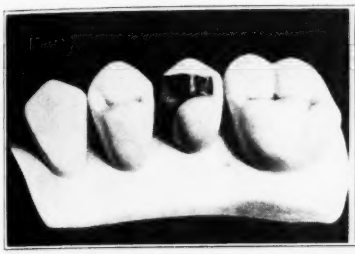

Fig. 8

Fig. 9

Fig. 10

All during this operating the chips are washed away by the use of water taken from the original water which started at a temperature of from 110° to 115° F. This frequent bathing with warm water has had a tendency to relieve the areas of both deep and superficial strain that may have developed in the wax during its manipulation. The water has gradually lost its heat and probably by the end of the process has reached room temperature. This room temperature water has had a tendency to reduce the mouth temperature so that on the removal of the pattern into room temperature the change in degree is probably very small. Therefore, since the elasticity has been practically dissipated and the expansion and contraction compensated, there is need of little fear of any rapid changes in the wax pattern due to differences between mouth and room temperature. However, it is advisable to quickly invest the new pattern in a room-temperature investment mixture. It is not a safe procedure to allow a pattern to remain for any great length of time, even in a fairly constant temperature, before it is invested, because eventually any areas of tension which may remain in the wax will finally assert themselves and a warpage will result. This is especially true if the room temperature undergoes variation.

The making of a wax pattern for any other type of cavity has essentially the same technic. To illustrate further: the wax for a mesio-occluso-distal cavity (Fig. 9) is molded to a wedge form and the wedge is then split and molded into two cones. These cones are separated and tapered sufficiently to permit the points to reach the gingival wall unhindered (Fig. 10). The whole mass is then forced into the cavity and over the occlusal surface of the tooth, every effort being made to adapt the wax and keep it adapted to the walls and margins of the cavity (Fig. 11). When the wax ceases to move under pressure it is bathed with warm water to relieve the elasticity. The patient is then requested to close the jaws to assist in forcing the wax further into the cavity if possible, and to indicate the prominent points of occlusion. The wax is again molded to the cavity and tooth if the closing of the jaws has squeezed it away. The occlusal plane of the pattern is next established (Fig. 12). The surplus is then cut out of the embrasures (Fig. 13) and the interproximal space is freed. The contact points are then cut thru with "A" silk thread and the final burnishing and polishing are given attention (Fig. 14). It is the operator's desire to adapt the wax and keep it adapted so the direction of cutting, burnishing and polishing should be done toward

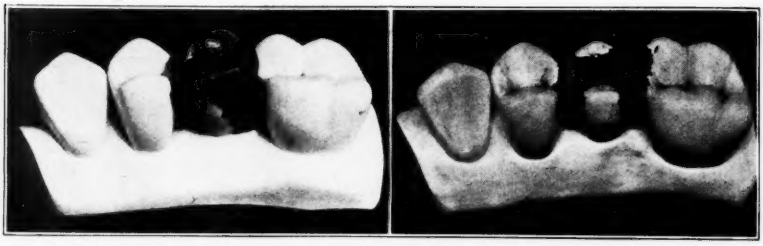

Fig. 11 Fig. 12

the walls and margins in order that the wax may not be dragged away from adaptation. Extreme care and a rational technic are rewarded by a perfect wax pattern.

Removal of the Pattern

Some operators advocate that the wax pattern be blown from the cavity by a blast of air, others that the pattern be washed out with a stream of water from a syringe, but I am of the opinion that, where it is possible to perform either of these removals, the cavity has not sufficient resistance form or the wax is not perfectly adapted or both faults prevail. A perfectly adapted wax pattern in a properly resistant cavity has developed too much frictional resistance to be dislodged by a stream of water or air. It will come away only with a distinct "tug" or "let go." Only two methods for the removal of a pattern are available; the first is by the use of an explorer tine, and the second by the use of the sprue. It is my custom to remove practically all patterns with an explorer tine except for mesio-inciso-distal and mesio-occluso-distal cavities, and these I remove on the sprue.

In a previous article[1] I have presented my ideas and reasons for making two pieces, mesio-occluso-distal restoration in molars, so that the only mesio-occluso-distal wax patterns I have occasion to remove in one piece are those made in bicuspids.

Attaching the Sprue

The same technic of attaching the sprue may be followed whether the wax pattern is held in the hand or remains in the tooth. The sprue should be held by the thumb and finger and the end warmed in the flame sufficiently to melt its way into the pattern quickly. As soon as it has passed a millimeter or more into the pattern the assistant should touch the sprue near the fingers with a pellet of cotton saturated in top or ice water. This chills the sprue which in turn congeals the wax around its point and does not subject the pattern to any general temperature change.

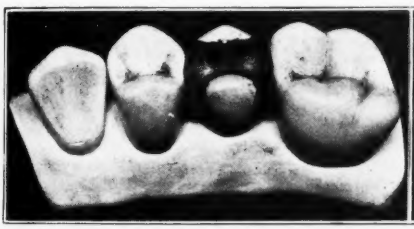

Fig. 13

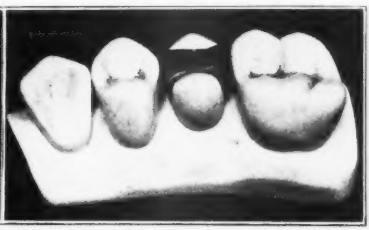

Fig. 14

Matrices

In the making of wax patterns for some cases it may be necessary to use a matrix. The most common type of case is one in which the adjacent crown is missing. Ordinarily the matrix is needed only during the initial adaption of the wax and can be removed for the final carving and polishing. The requirements of the case will determine whether a matrix must be made or some commercial type of matrix can be used.

The direct method of making a pattern has been illustrated in this paper, but

[1] "Gold Inlays," *Jour. Nat. Dental Assoc.*, June, 1920, p. 479.

the underlying principles can be applied to the indirect method with equally good results.

Discussion

A. W. Thornton, Montreal, Canada: Some years ago in Cleveland I heard Dr. Price make an assertion that has dwelt with me ever since. He said that in dentistry there is no such word as "perfection". When the essayist spoke of making a perfect cavity and a perfect wax filling, he just eliminated the word approximately. For that is the best we can do. If a man were to make a perfect restoration, it would have to be made by growing in natural tooth tissue to restore the anatomical outline to the perfection of teeth we see occasionally. But these teeth do not need any kind of restoration, cast or otherwise.

There are some principles that might be laid down in this matter; and perhaps, after all, if we could obtain or receive, into our minds, some of these principles and carry them out in our work day by day, it would do us more good than to adopt a single man's technic or operations. If we can understand the principles, we can usually work out the technic for ourselves.

In my teaching of all prosthetic restorations, at the university, I lay down three principles for the students in all their work: we seek for accuracy of adaptation, continuity of outline, and harmony with environment. If we can follow these, we will not be very sorry over the results which we obtain. The difficulty is always to follow out these different principles.

Dr. Volland said that the direct method of making a pattern has been illustrated in this paper but the underlying principles can be applied to the indirect method with equally good results. While the principles may apply, the operation of making a wax inlay and then reproducing it in gold in the direct and indirect methods are entirely different in many respects, because the conditions which we have to meet and overcome are not at all similar. Those of you who do this class of restoration know how very difficult it is to make a wax pattern in the mouth. Some patients' tongues have an unfortunate habit of getting into the wrong place. Then it is only the expert man who can prepare a cavity as it should be prepared and not cause any hemorrhage. And further we have the saliva.

When we come to the indirect method, we have none of these difficulties to contend with, altho there may be another set of difficulties presented.

My preference is for the indirect method in the making of a wax pattern. I know it would be quite impossible to adopt either one method or the other and follow it exclusively. And yet there are difficulties to be overcome and advantages in both methods.

To my mind I am not sure that we will not attain to the near perfection standpoint that we would like to reach, by disassociating this work from the hands and minds of the dentist for a short time until some standards are established.

The essayist spoke about expansion and contraction. The thing that I wish to understand is, how much expansion and how much contraction take place in the wax or gold in the investment material? I think it would be well for a great body like this or some body of dentists to relegate this work to the department of science in the university, and let them carry on a series of experiments to determine just how much wax expands or contracts with heat or cold.

Then he spoke of standard investments. What is a standard investment? How much does it expand and how much does it contract? What temperature will it stand so that it will not lose its integrity? There are very few dentists, in daily work at their chair, who are prepared to give to these matters the careful, scientific consideration they demand. I therefore think that a great deal of good would accrue to the dental profession if these purely scientific subjects were given over, with the knowledge that we could give, to the men on the faculties of applied science; and let them determine for us the scientific aspect and then leave it for us to work out the purely mechanical details.

There is one question about which there can be no difference of opinion. Much of the faulty work which we see in the mouth is due to the fact that we do not yet possess an accurate knowledge of dental anatomy. Very frequently in our textbooks in regard to this work, especially in regard to crown and bridge work, we meet the expression, used not just in that sense by the essayist, "put the wax in the mouth and then have the patient close the teeth"; and the idea is conveyed that the exact anatomical reproduction is obtained in that way. You know and I know that the piece of wax bitten into between the upper and lower teeth will not ever produce an anatomical reproduction; and therefore many faulty restorations are made in inlay work and crown and bridge-work by simply taking that piece of wax and reproducing it.

Let me say with all earnestness that today as never before the public is looking to the dental profession for a standard of work such as has never before been done, and the medical profession is looking to us for co-operation in this. And I know, after eight years of exclusive hospital practice, that many of the ills from which people suffer are the direct results

of imperfect dental work; and you and I must see to it, because of our love for the profession to which we belong and because of the humanitarian ideas and principles that should govern every man's life and conduct, that we should give to the patients who come to us, rich or poor, high or low, the best service of which we are capable.

Dr. Volland (closing): It was not my endeavor in presenting this paper to cover the entire inlay field; merely one phase. In doing that it was my aim to call attention to the underlying principles which govern the behavior of wax when it is being manipulated. It is not my intention to urge any given method of making a wax pattern but rather to urge that the physical characteristics of wax be considered when devising a technical procedure for the making of a wax pattern.

Waxes vary in color, hardness, melting-point, elasticity lock, etc., but when any wax is being worked it exhibits a group of physical characteristics common to all waxes, namely expansion, contraction and elasticity. The operator must successfully deal with these characteristics if he obtains a perfect wax pattern.

Dr. Thornton has spoken of my use of the term "perfect". I am not discussing the *ideal* filling, or filling material which Dr. Thornton has mentioned. There are inherent defects which cannot be overcome in any operative procedure. These defects are due to material, technic, limits of human accomplishments, etc. But when we eliminate all the defects that it is possible to eliminate, then perfection of that process is obtained. I therefore contend that a perfect *wax* pattern, and a perfect *gold* inlay can be made. The restoration may not be ideal. The ideal filling will be the reproduction, not the restoration of lost tooth substance.

When I first finished my college course I thought the ideal or perfect cavity preparation was practiced only in the college because I had been told by practitioners that such results could not be obtained in a practice. Many reasons for this condition were given. But I know now that such need not be the case. If a dentist fixes a high standard and ever strives to reach that standard, he will find constant opportunity to make typical and perfect cavity preparations. The same is true of all other dental work.

I have no serious criticism of the indirect method of making inlays. I seldom use it because I feel I have no need for it. I recognize that in a technical procedure desirable results can be obtained by different methods, provided these methods comprehend the fundamental principles that govern the operation. Therefore, if one's capabilities produce the best results by use of the indirect method I see no reason why it should not be used.

In closing I would like to make these statements: It is not my idea in presenting this paper that you change your technic, only in so far as you see from what I have said that you can improve your own method of making inlays. My method accomplishes desirable results in my hands, and you are welcome to any part or all of it. It requires as much skill, pains and conscientious efforts to make a good gold inlay as it does to make a good foil filling or any other restoration. The cavity preparation must be right. Perfect inlays cannot be made from imperfect wax patterns. A desirable inlay will not come out of an abused investment. One step in the process will not correct a fault in any other step. Perfection in each step is essential if a perfect gold inlay is to be the result. The underlying fundamental characteristics of all the materials used must be taken into consideration and respected.

ELECTIVE LOCALIZATION OF BACTERIA ISOLATED FROM INFECTED TEETH

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Rochester, Minnesota

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THE very important contributions to the subject of the influence of oral sepsis in systemic disease by Billings, Rosenow, Gilmer, Gilmer and Moody, C. H. Mayo, Hartzell, Hartzell and Henrici, White, Irons, and many others are so familiar to us all that comment on their work is quite unnecessary. The encouraging results obtained by certain workers in this field and the disappointments encountered by others have served to increase interest and discussion. Our investigation was begun with the hope that we might reach some conclusion with regard to when we are justified in extracting pulpless teeth, particularly those in which roentgenograms do not reveal evidence of infection.

From the vast number of patients who come to the Mayo Clinic suffering from chronic disease we selected for study one hundred patients in whom infected teeth were demonstrable. In obtaining cultures every possible precaution was taken to prevent contamination. Block anesthesia was administered before the patient was placed on the table. The patient was covered with sterile sheets and towels, with only the nose and mouth exposed. The field of operation, after being thoroly dried, was freely painted with alcohol first and then with iodin, and carefully walled off with sterile gauze in order to prevent saliva and mucus from coming in contact with the tissues. As in major operations rubber gloves, face masks, and sterile gowns were used by the operator and assistant.

The teeth to be cultured were removed after reflecting the mucoperiosteum and removing all or a portion of the external plate over the root of the tooth. The amount of alveolar process removed depended on the position of the tooth and the amount of infection. Granulomas were removed from their sockets and placed immediately in a sterile tube and transferred to the laboratory. If the tooth from which a culture was to be made had no definite granuloma, it was removed carefully and placed in a sterile test-tube with the apex down. The cotton plug was then forced down the tube until it reached the crown, thereby preventing the root end from coming in contact with portions of the test-tube contaminated by the crown of the tooth. In the laboratory the bottom of the tube was cracked off, the tooth removed, and cultures made either from the apex of the tooth or from the material in the pulp canals.

Removing impacted teeth in a sterile manner was often impossible, especially in the region of the third molars. The tooth therefore was washed in alcohol, passed thru a flame, wrapped in sterile gauze, and cracked open in a vise. The pulp was carefully removed and transferred to culture medium.

In making cultures from cysts, the mucoperiosteum was reflected, the alveolar plate removed, and, by means of a

sterile pipette or needle, the cyst wall was punctured and enough cystic fluid withdrawn to make cultures.

In cases of pyorrhea an attempt was made to collect material from the bottom of the pockets. This was accomplished by withdrawing the material thru a fine pipette which was carefully introduced into the pocket.

In studying the bacteriology of dental infections, we followed the methods outlined by Rosenow in his "Studies on Elective Localization" (21). The granuloma, tooth pulp, and material from cysts and pyorrhea pockets were spread on the surface of blood-agar plates and inoculated into tall tubes of glucose-brain broth. The cultures were inoculated at from 35° to 37° C. A profuse growth usually occurred in twelve hours, altho some cultures required from eighteen to twenty-four hours' incubation. Rabbits were injected intravenously as soon as a profuse growth occurred, the size of the dose varying with the weight of the animal, 2 c.c. culture mediums for every 1000 gm. The viability and identity of the organisms injected were determined by plating on blood agar. The growth thus obtained was then compared with that obtained on the blood agar plates inoculated directly. The rabbits were etherized and necropsied usually from three to six days after inoculations and thoroly examined for lesions. Cultures were always made routinely on blood-agar plates and in glucose-brain broth from the lesions and from fluids and organs of the body, etc., such as blood, bile, urine, joint fluid, kidneys, and spleen. The character of the lesions was determined by studying sections stained with hematoxylin and eosin and the causative organism identified in the lesions by Gram's stain.

RESULTS OF INJECTION

In the table is given the percentage incidence of lesions in the various organs of rabbits following intravenous injection of streptococci isolated from the dental foci of 100 patients. The figures are directly comparable.

LOCALIZATION OF BACTERIA FROM DENTAL FOCI OF INFECTION

Diseases of the Patients	Strains—100	Animals injected 262	Percentage of Animals Showing Lesions in													
			Kidney	Bladder	Kidney and Bladder	Joints	Muscles	Joints and Muscles	Stomach			Duodenum	Endocardium	Myocardium	Nerves	Gallbladder
									Hemorrhage	Ulcer	Hemorrhage and Ulcer					
Pyelonephritis	9	50	82	20	6	16	4	..	4	..	..	..	4	6	.	.
Focal nephritis	6	19	84	..	..	26	37	5	..	..	..	..	5	5	.	.
Arthritis	36	89	3	..	..	81	48	35	9	6	2	..	1	2	.	.
Myositis	7	22	..	..	..	36	82	14	9	..	..	..	5	9	9	5
Ulcer of the stomach	10	22	..	..	..	9	23	..	68	23	23	..				
Hematuria	3	14	21	..	..	7	7	..	14	..	..	..				
No definite complaint	29	46	2	..	..	2	24	..	13	2	..	..				

Fifty rabbits were injected with the culture obtained from the infected teeth of nine patients who presented undoubted clinical and cystoscopic evidence of pyelonephritis. In none of the nine cases were there any urinary obstructions either from stone, stricture, or prostate to which the urinary infection could be attributed. Each patient in this group had many infected teeth. Lesions occurred in the kidneys of 82 per cent of the animals injected, while the lesions in other organs were comparatively slight.

Lesions occurred in 84 per cent of the nineteen animals injected with streptococci isolated from the dental foci of patients with focal nephritis. These patients, like those with pyelonephritis, had no urinary obstruction to which the disease could be attributed, but they had infected tonsils as well as infected teeth. In many animals injected with cultures from the tonsils equally good results were obtained, but since this paper deals only with dental foci, such results are not recorded in the table.

Of the eighty-nine rabbits injected intravenously with streptococci isolated from the dental foci of thirty-six patients with arthritis, 81 per cent showed involvement of the joints, 48 per cent involvement of the muscles, and 35 per cent involvement of the joints and muscles. Lesions in other tissues and organs were relatively slight.

It is interesting to compare the results obtained in cases of arthritis with those obtained in cases of myositis. Of the twenty-two animals injected with streptococcci isolated from the infected teeth of seven patients 82 per cent had lesions in muscles, 36 per cent lesions in joints, and 14 per cent lesions in muscles and joints. Many patients with myositis complained of pains in the joints, while many patients with arthritis complained of muscular pains. This undoubtedly explains the high incidence of lesions in the muscles of rabbits with arthritis and the high incidence of joint involvement in rabbits with myostis.

Hemorrhages in the mucous membrane of the stomach occurred in 68 per cent and hemorrhages and ulcers in 23 per cent of twenty-two animals injected with streptococci isolated from the infected teeth of patients with gastric ulcer. This percentage is in marked contrast to the percentage of lesions in the stomach of animals injected with other strains.

Only three patients with hematuria were observed; in all three a very marked degree of dental sepsis was found. Careful medical examination failed to reveal anything to which the disease could be attributed other than the infection in and around the teeth. Of the fourteen animals injected only three (21 per cent) had slight lesions in the kidneys. Practically normal urine was found in the bladders of these animals. Even tho these three cases seemed ideal for study, definite deductions cannot be made because too few animals were injected. If a relationship exists between the disease and focal infection, production of hematuria in animals may call for some untried method of infecting the animals, or in the production of a chronic focus.

In the last group of cases forty-six rabbits were injected with cultures obtained from the dental foci of twenty-nine patients, none of whom had any specific disease. Some complained of headache, many of vague pains, some of a general run down condition, and some had no complaint. In these cases no specific localization occurred as it did in the first five groups recorded in the table. The highest incidence of lesions was in muscles; probably this is explained by the fact that many of these patients complained of vague pains.

REPORT OF CASES

Case No. 311972, Mr. F. M. F., aged thirty-eight years, came to the Mayo Clinic April 12, 1920, because of attacks of inflammation in the right eye (Fig. 1). These had occurred every spring and fall for six years. The patient had had attacks of rheumatism for ten years. The

attacks of inflammation in his right eye were always preceded by pain and soreness of the upper right second bicuspid, which came on several days before the eye became inflamed. Each attack was accompanied by general rheumatic pain.

The patient's general examination was negative. Roentgenograms of the teeth showed evidence of periapical infection in the lower left second bicuspid (Fig. 2). The upper right second bicuspid which caused so much discomfort several days before each attack of iritis showed no evidence of infection. Caries was not

Fig. 1.—(Case 311972.) Acute iritis from dental sepsis.

present nor had any restoration been attached to this tooth. An electric test indicated that the pulp was vital but it did not respond so readily as the other teeth.

The upper right second bicuspid and the lower left second bicuspid were removed surgically. Four days later the condition of the right eye was normal. From the granuloma of the lower bicuspid and the pulp of the upper bicuspid pure cultures of green-producing streptococci were obtained.

Rabbit 83 (albino) was injected intravenously at 10:00 A. M. with 5 c. c. glucose-brain-broth culture from the pulp of the upper right second bicuspid. At 8:00 P. M. the rabbit was found with his eyelids glued together by dried, turbid, lachrymal fluid. Extreme circumcorneal congestion was found on opening the lids, and a marked lachrymation. At 9:30 P. M. both eyes were extremely red; the iris showing marked congestion with numerous small hemorrhages (Fig. 3). The fluid in the anterior chamber of both eyes appeared slightly cloudy and the pupils were contracted; they measured about 3.5 by 5 mm. There was decided photophobia. At 11:00 P. M. the rabbit was anesthetized and examined for lesions. On the inner anterior aspect of the left tibia and opposite the apical third of the lower left incisor definite periosteal lesions were found. Cultures made from the fluid in the anterior chamber and from the iris yielded pure cultures of green-producing streptococci.

Rabbits 84 and 85 (albinos) were injected intravenously at 8:00 P. M., one with a culture from the pulp of the upper right second bicuspid and the other with a culture from the granuloma of the lower left second bicuspid. Both developed slight iritis by midnight. The iritis persisted the following day and then gradually disappeared.

Rabbit 90 (albino) was injected, by means of a very fine pipette, into the anterior chamber of the right eye with a few drops of a pure culture of streptococci obtained from the fluid in the anterior chambers of the eyes of rabbit 83. The cornea in the left eye of the injected rabbit was punctured with a small fine pipette. The following day there were marked lachrymation and congestion of the vessels of the left eye and considerable swelling of the eyelids. There was decided photophobia. The rabbit was otherwise well. On the following day he was anesthetized and examined for lesions. On removing the right eye the sclera was found to be quite hemorrhagic and infiltrated. The vitreous was clear, but the cornea was much thickened. There was moderate edema of the iris and the vessels were markedly congested, but the iris was not covered by any exudate. On

further dissection of the animal, a moderate number of large and small hemorrhages were found in the muscles and periosteum, especially on the inner aspect of the right tibia and along the internal popliteal nerves of the leg. There were also a number of hemorrhages in the lower portion of the left tibialis anticus. Hemorrhagic edematous areas were found in the periosteum opposite the lower left incisor and opposite the roots of the upper incisors (Fig. 4). The pulps of both lower incisors were extremely congested and hemorrhagic. Cultures were made from the iris and from the fluid in the anterior chamber of both eyes, from the pulp of the lower incisors, from the lesions in the muscles, and from the joint fluids; all yielded pure cultures of green-producing streptococci. Cultures made from normal muscle, blood, spleen, and bile, were negative.

Rabbit 94 (albino) was injected by means of a small fine pipette, into the anterior chamber of the left eye with a few drops of a culture obtained from the iris of rabbit 90. The day following the injection there were marked lachrymation and congestion of the vessels of the left eye. Each day the swelling increased and the fluid in the anterior chamber of the eye became more turbid until it was almost pus-like in appearance. The rabbit was etherized ten days after injection. Cultures were made from the iris and from the fluid in the anterior chamber of both eyes and from the joint fluids. Cultures from the fluid in the anterior chamber and from the iris of the uninjected eye as well as from the injected eye and the joint fluids showed pure cultures of green-producing streptococci. All other cultures were negative.

Rabbit 104 was injected intravenously with a pure culture of streptococci obtained from the iris of rabbit 94. Two days following the injection there were marked congestion of the vessels of the conjunctiva, marked circumcorneal injection, and turbidity of the fluid in the anterior chamber. On the third day there were even more congestion of the vessels and more circumcorneal injection (Fig. 5). The rabbit seemed muscle sore. Necropsy revealed a moderate number of muscle lesions, particularly around the joints and the anterior and outer aspects of both the left and right tibias. There was a slight area of infiltration over the upper left incisor. Both the knee and ankle joints contained a moderate amount of turbid fluid. There

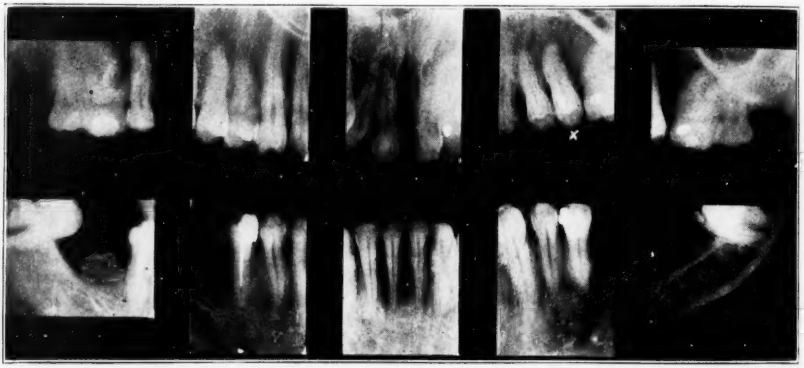
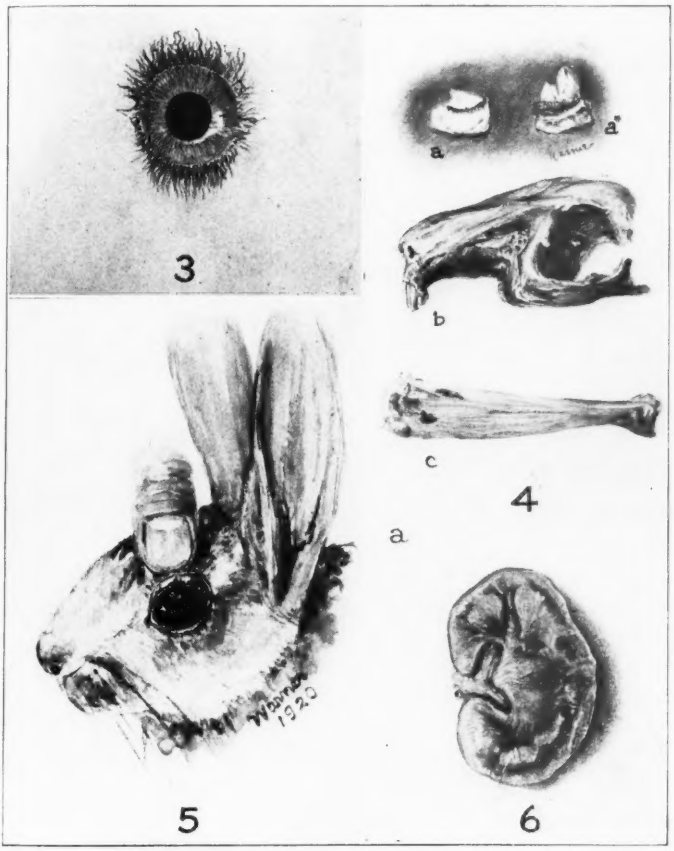


Fig. 2.—(Case 311972.) Culture from the pulp of the tooth marked X produced iritis following injection into rabbits.

was no evidence of lesions in the viscera. Cultures made from the fluid in the anterior chamber, from the iris of the eyes, from the joint fluids, and from the lesions in the muscles yielded pure cultures of green-producing streptococci.

Case No. 328302, Mrs. E. D., aged thirty years, came for examination



Figs. 3—6.—Fig. 3, injection of iris and sclera in eye of rabbit 83 following inoculation with culture of green-producing streptococci from tooth extracted in Case 311972. Fig. 4, rabbit 90 injected with green-producing streptococci from the iris of rabbit 83 (Fig. 3): *a*. Marked congestion of the vessels of the posterior aspect of iris of the left (uninjected) eye; *a**, marked swelling and edema of the cornea; congestion of the vessels and hemorrhages of the iris of the right (injected) eye; *b*, hemorrhagic and edematous area opposite root of the upper left incisor; *c*, hemorrhagic and edematous area of the muscles of the inner and anterior aspect of the right tibia at the point of insertion. Fig. 5, iritis in rabbit 104 following intravenous injection of green-producing streptococci from iris of rabbit 90 (Fig. 4). Fig. 6, marked swelling and edema of medulla and areas of hemorrhage and necrosis in rabbit's kidney four days after intravenous injection of streptococci obtained from an infected tooth of the patient in Case 328302.

August 6, 1920, giving a history of having suffered from frequent and painful micturition for six or seven years.

The patient's physical examination was negative except for a rather marked suprapubic tenderness. A roentgenogram of the urinary tract was negative and a test of kidney function showed a normal return of phenolsulphonephthalein. Cystoscopic examination revealed a subacute areal cystitis. From one to five pus cells to the microscopic field were found in the urine obtained from the kidneys, while approximately fifty pus cells to the microscopic field was found in the urine obtained from the bladder. Cultures made from the urine showed pure cultures of colon bacilli. Examination of the nose and throat was negative. A roentgenogram of the patient's jaws revealed five devitalized teeth, one root, an impacted tooth, and a slight degree of pyorrhea. Three of the devitalized teeth showed evidence of periapical infection. Several of the vital teeth showed metallic restorations but none showed caries. One of the vital teeth (upper left first molar) which had most of the occlusal surface restored by amalgam was sore when pressure was applied to it. The cystoscopic findings and the history of the case seemed to indicate a previous pyelonephritis. The infection was apparently kept up from some source of infection outside the urinary tract.

The devitalized teeth including the two which did not show shadows, and the vital tooth which was sore on pressure were removed surgically.

Ten animals were injected with the primary cultures from the infected teeth in glucose-brain broth; eight of the ten developed marked lesions in the kidneys (Fig. 6), and three developed lesions in the urinary bladder. The streptococcus was recovered from the lesions in the kidneys of the eight rabbits (Fig. 7).

Five animals were injected in the second animal passage. Lesions developed in the kidneys of four and marked lesions in the bladder of one. One rabbit showed no lesions.

The streptococcus was again recovered from the lesions in the kidneys and reinjected into three rabbits. Lesions were found in the kidneys of all, but they were less marked than those found in the kidneys of the animals in the first and second animal passages.

Lesions occurred in the medulla of

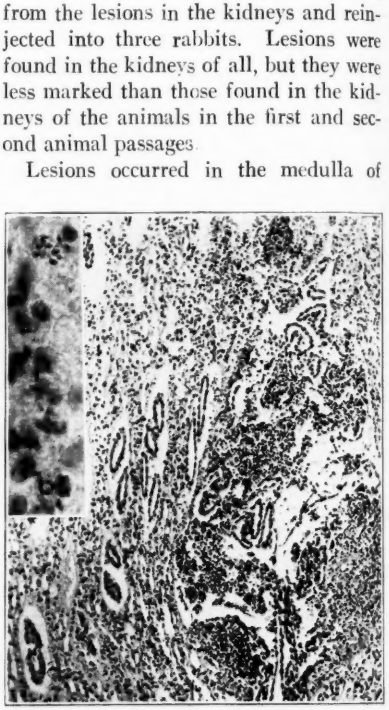


Fig. 7.—*a*, Section of rabbit's kidney, showing necrotic area with marked leukocytic infiltration, four days after intravenous injection of green-producing streptococci from an infected tooth of the patient in Case 328302. Hematoxylin and eosin. x 100. *b*, Diplococci in and about leukocytes in the necrotic area. Gram-Weigert. x 1000.

fifteen of the eighteen rabbits injected with cultures from infected teeth, in the cortex in six, and in the bladder in four. Examination of three of the eighteen rabbits was negative; two of these rabbits were examined for lesions twelve days after injection (all other animals were examined in from two to six days after injection). At necropsy the urine of ten contained albumin, pus cells, and

erythrocytes, and that of several contained either pus casts or granular casts. In eight of the animals the bladder was empty at necropsy. Six had lesions in organs other than the kidney and bladder, but these were relatively slight. Three of the animals had a few pin-point hemorrhages in the stomach, two showed small lesions in the myocardium, one of which also showed some joint involvement, and still another animal had a few lesions in the muscles.

At necropsy cultures were made from the kidney, urine, spleen, bile, liver, blood and joint fluids whether or not lesions were present. In all but two of the animals (both of which were negative) the streptococci were recovered from the kidneys and urine. In ten animals all other cultures were negative. Four of the eighteen animals were found dead, and in these four the organisms were recovered in all organs from which cultures were made. In the remaining four the organism was recovered from the blood, the joint fluid, the liver, and from the kidney or urine. The colon bacillus was not found in the urine or kidneys of any of the animals. Several cultures made from the patient's urine early in the investigation showed only gram-negative bacilli. Two animals were injected with a culture of these gram-negative bacilli and neither of the animals developed lesions of the urinary tract.[1]

Several times during the investigation, after the removal of infected teeth, green-producing streptococci and gram-negative bacilli were found in the patient's urine. Six rabbits were injected wth these mixed cultures made at various times. Lesions occurred in the kidneys of all, in the bladder of one, and in the muscles of two. Five of the six rabbits had urine in the bladder at necropsy and in four of these albumin, pus cells, and erythrocytes were found. The streptococcus and the colon bacillus were recovered from the lesions in the kidneys of three of the animals. Cultures were also made from the gums of the patient. These yielded green-producing streptococci, indifferent streptococci, staphylococci, and gram-negative bacilli. They were injected into three animals. None of the three animals developed lesions in the urinary tract or any other organs. Because of the experimental evidence produced with cultures from the infected teeth it was thought best to remove the patient's tonsils. Cultures from these showed green-producing streptococci and staphylococci. Two rabbits were injected with these cultures, one of which developed marked lesions in the kidney. Pus cells and an occasional granular cast were found in the urine of this rabbit.

Case No. 93820, Mr. E. H., aged thirty years, came for examination March 17, 1920; he had suffered with muscular pains in the arms, legs, and back and sometimes in the joints for five years before coming to the Clinic.

The patient's general examination was negative. Roentgenograms of the teeth revealed evidence of periapical infection at the root ends of six. The tonsils were moderately infected.

The teeth were removed surgically and cultures made, all of which contained green-producing streptococci in countless numbers and a few staphylococci. The tonsils were removed but not cultured. The patient has not reported his condition since operation.

Rabbit 18 was injected intravenously at 8:30 A. M. with 5 c. c. glucose-brain-broth culture from a granuloma found at the apex of one of the extracted teeth. The following morning the rabbit was lame and appeared sick. About noon he died and was immediately examined. Very pronounced lesions were found in the muscles of the thigh and shoulder and in the intercostal muscles between

[1] This case together with others was reported in a recent article by Bumpus and Meisser (3). Since that time the upper left first molar (which was still partially vital but sore when pressure was applied) has been extracted, the patient's tonsils removed, and animals injected with these cultures as well as with additional cultures made from patient's urine.

the sixth, seventh, and eighth ribs on the right side. A moderate number of small lesions were scattered in the tendonous portions of the muscles thruout the body. A hemorrhagic lesion was also found in the middle third of the right sciatic nerve. The bursa surrounding the long head of the biceps-femoris was hemorrhagic and edematous. An excessive amount of very turbid synovial fluid was found in a distended left knee and right shoulder joint and a large hemorrhagic lesion was found in the periosteum opposite the lower right incisor. In the wall of the left ventricle one hemorrhagic lesion was found. Cultures made from the turbid fluid in the joints and from the lesions in the muscles yielded pure cultures of green-producing streptococci.

Rabbit 19 was injected intravenously with the streptococci isolated from the lesions in the muscles of rabbit 18. Six days following the injection the animal was chloroformed and examined. A moderate number of hemorrhagic lesions were scattered in the tendonous portions of the muscles thruout the body. In the periosteum on the inner anterior aspect of the left and right tibias hemorrhagic lesions were found. Both knee joints contained excessive amounts of turbid synovial fluid. Cultures from the lesions in the muscles and from the joint fluids showed only streptococci.

Rabbit 20 was injected intravenously with streptococci isolated from the joint fluids of rabbit 18. This animal was chloroformed the sixth day. Thick turbid fluid was found in both ankle joints and large hemorrhagic lesions in the gluteus maximus muscles and in the anterior tibial muscles. The streptococcus was recovered in pure culture from the joint fluids and from the lesions in the muscles.

Case No. 347953, Mrs. W. A. S., aged thirty-nine years, was brought to the Clinic January 29, 1921, because of a typical multiple arthritis which had had its onset in May, 1920. Beginning in the knee joints the arthritis had gradually involved one joint after another until the hips, ankles, shoulders, elbows, phalangeal joints, and even the temporomandibular joint had become involved.

The patient's general examination was negative and the examination of the nose and throat failed to reveal anything suggestive of focal infection. Roentgenograms of the teeth showed evidence of periapical infection at the root apices of seven.

One of the infected teeth was removed surgically one week after the patient came to the Clinic. A slight reaction followed the removal of this tooth. Five days later two of the infected teeth were removed. Again the operation was followed by a slight reaction, but within a few days the patient said that she felt better than she had for the last few months. About a week after this extraction, the patient was able to walk around the room with the help of her nurse. Her condition improved from day to day. Eleven days after the second extraction the remaining infected teeth were removed. Practically no reaction followed this operation. A month after the operation the patient was able to walk with the use of a cane.

From five of the seven infected teeth pure cultures of green-producing streptococci were obtained, and from two of the teeth a few staphylococci together with countless numbers of streptococci.

Six rabbits were injected with the primary cultures obtained from the teeth removed at the first and second operations. All the rabbits developed marked multiple arthritis, three developed a few muscle lesions which were relatively slight, and one developed a few questionable lesions in the kidneys. The joints of these rabbits were slightly distended and contained thick turbid synovial fluid which was excessive in amount. From the joint fluids of these animals the streptococci were again recovered.

With the cultures obtained from the

infected teeth removed last, two rabbits were injected intravenously. Necropsy of these animals revealed no evidence of lesions in any organs.

SUMMARY AND DISCUSSION

The results following the intravenous injection of animals with streptococci isolated from dental foci, as emphasized by the illustrated cases and by the results recorded in the table, show that the bacteria within the foci had an elective affinity for organs and tissues similar to those involved in the patients. All the cases studied, except the twenty-nine recorded in the last group, were carefully selected by the physicians in the various sections in the Clinic.

The results in pyelonephritis are of special interest because the disease has been generally thought to be due to colon bacilli. This organism is almost constantly present in the urine of patients with pyelonephritis, and because of the apparent direct lymphatic connection between the kidneys and the colon, the lymphatics have been considered the pathway of the renal infection. But the fact that patients who receive treatment by kidney lavage return to clinics year after year for further treatment suggests that the treatment had been directed against the outcome of the disease. The presence of infected teeth or tonsils suggested to us that streptococci might cause the disease. Patients were therefore carefully selected, their infected teeth were removed surgically, and rabbits were injected with the cultures obtained. That the bacteria within the dental foci had a marked affinity for the urinary tract seemed certain because lesions occurred in the kidneys of 82 per cent of the injected animals, while lesions found outside the urinary tract were relatively slight. Furthermore, the injection of colon bacilli isolated from the urine of these patients failed to produce lesions in the kidneys when injected into animals. This seems to indicate that the colon bacillus was a secondary invader and that the infection was produced by the streptococcus (4).

Recently Meisser and Bumpus (15) have made a study of the relation of oral infection to the submucous ulcer of the urinary bladder, a disease which has generally been thought to be the result of an adjacent infection. In patients with this disease, as in patients with pyelonephritis, infected teeth or infected tonsils or both, were usually present. The tissue changes in submucous ulcer indicate a blood-borne infection. The blood vessels are prominent, and polymorphonuclear leukocytes, lymphocytes, and extravasated erythrocytes are found not only within the lumen but also infiltrating the vessel walls and perivesical tissues. Since these perivesical changes with the cellular infiltration and edema are most marked in the outer coat of the bladder it seems that the infection is not carried by the urine. The fact that the urine in these patients is often sterile is further indication that the etiology of the disease must be sought outside the urinary tract.

Infected teeth and tonsils were removed and cultures injected into rabbits.

Lesions in the urinary bladders of the animals occurred in a high percentage of cases, while negative results were obtained in animals injected with colon bacilli found in the urine of several patients. In two patients in the series the ulcers were removed by operation. Carefully stained sections by the Gram-Weigert method revealed diplococci within the areas of round-cell infiltration.

Our results in arthritis, myositis, and ulcer of the stomach corroborate the results of Rosenow and other workers. That the streptococci within the focus of these patients had a selective affinity for tissues and organs in the animals similar to those involved in the patient is certain because the percentage incidence of lesions in such organs and tissues is very high, while in other organs and tissues it is relatively slight. The results obtained in the case of arthritis cited in this paper are particularly interesting.

The patient who before coming to the Clinic had spent the last few months in bed or in a wheel chair recovered so rapidly that in a few weeks after the removal of her infected teeth she was able to walk. Because of the acute exacerbation in symptoms which so often follows the removal of infected teeth only one tooth was removed at the first operation. Five days elapsed before the second operation, and eleven days between the second and third operations. All the animals injected with cultures obtained at the first two operations developed marked multiple arthritis. The animals injected with cultures obtained from the infected teeth removed at the third operation were negative. This condition commonly occurs in our experimental work and is an indication that some change takes place in the specificity of the organism in the remaining foci, especially if the patient shows a marked improvement and if the teeth are removed at long intervals. But such results do not mean that it is not necessary to eradicate all infection because these very foci may again acquire that specificity, and if the patient's immunity becomes lowered there will be a recurrence of former symptoms.

Recently a case of chronic nephritis has been studied by Rosenow and one of us. The patient had suffered from nephritis for seven years and from colds in the head as long as he could remember. His colds were attended with fever, subsequent to which acute exacerbations of nephritis developed. His history strongly suggested the nasopharynx as a factor in the exacerbation. Cultures from the nasal mucous membrane, tonsils, and left antrum showed *Staphylococcus aureus* to be the predominating organism. By intravenous injection the cultures were passed thru thirty-two rabbits, six animal passages in all. All but two of the rabbits developed very pronounced lesions in the kidney. The percentage incidence of lesions in other organs was relatively slight in animals injected with primary cultures, but it increased on successive animal passages.

The two lower cuspids of four dogs each were devitalized in a sterile manner and infected with the same organism. All dogs were catheterized at the time the teeth were devitalized and the urine was normal. They were catheterized again in from five to twenty-five days after operation on the teeth, and each successive time the urine contained more albumin, pus cells, and erythrocytes. From six to eight weeks after the devitalization of the teeth one kidney was removed and in each instance localized nephritis involving part of the medulla and cortex was found. The dogs were examined for lesions in from two to four weeks after the removal of the first kidney and in each localized nephritis was found, nivolving a larger part of the medulla and cortex than was involved in the kidney removed at operation. One dog had a marked pyelitis, the pelvis being filled with pus and a thick adherent membrane and in the bladder of this dog, long, rough, nonlaminated pumice-like concretions were found. On chemical analysis these proved to be calcium oxalate. With the organisms recovered from the lesions in the kidneys and from the granulomas found at the apices of the infected teeth, many rabbits were injected intravenously. Lesions were again produced. The same organism when injected subcutaneously into guinea-pigs produced a local abscess, but when it was recovered from the abscess and injected intravenously into animals it failed to produce lesions in the kidneys. A more detailed discussion of this experiment is reserved for a separate report by Rosenow and Meisser.

This case is of special interest because localization was obtained in organs and tissues of animals similar to those involved in the patient by methods other than intravenous injection of bacteria. This patient had no infected teeth, but in all the experiments which have thus far been followed up, in which patients had both infected teeth and infected tonsils,

the organisms recovered from both foci injected intravenously into animals produced the same results. To establish a chronic focus, we therefore removed the pulps from the two lower cuspids in each of four dogs and infected the pulp chambers with the same organism that produced the marked lesion in the kidneys of rabbits following intravenous injection. The dogs were allowed to live for from two to three months. Necropsy revealed granulomas at the apices of the infected teeth and a nephritis equally as severe as that produced in rabbits following large intravenous injections. This experiment demonstrates that a chronic focus can be established in animals similar to foci found in patients and that from such a focus a chronic disease may develop.

The animals injected intravenously with the streptococci isolated from the infected teeth of the patient with iritis and rheumatism developed iritis, arthritis, and myositis. More interesting are the results obtained in second and third animal passages when the injections consisted of only a few drops of the culture into the anterior chamber of one eye. Not only did these rabbits develop iritis in the uninjected eye, but they developed an arthritis and myositis equally as severe as that of animals injected intravenously with 5 c. c. of the culture. The results in these rabbits and in the dogs in which chronic foci were established at the apices of two teeth show that laboratory results are not dependent on overwhelming numbers of bacteria intravenously injected, but are the result of a selective affinity of the organisms for certain tissues or organs.

Our experiments show that chronic diseases are often the result of a hematogenous infection from bacteria harbored by infected teeth and that a relationship may exist between infected teeth and the patient's systemic condition even tho the teeth show no evidence of pathology in the roentgenogram. That the specificity of the organism is not dependent on the amount of infection in the mouth of a patient is emphasized by our experiments in the last twenty-nine cases recorded in the table. Altho considerable infection was present in the mouths of these patients, none had any definite complaint and in none of our experiments did we get definite specific localization.

Up to date we have cultured 113 pulpless teeth which were questionable in the roentgenogram, that is, teeth which are considered negative by many, or in which there is so little evidence of infection that they are usually considered harmless, and twenty-one pulpless teeth which in the roentgenogram showed no evidence whatsoever of infection. These were extracted from patients in whom we had reasons to believe that a relationship existed between the disease and some focus. Everyone of these teeth was found to be infected, and the fact that 85 of the 134 yielded pure cultures of green-producing streptococci would indicate that the positive cultures were not due to mouth contamination. The results in the animals injected with cultures from these teeth were as positive as those obtained in animals injected with cultures from granulomas found in the same mouth. Therefore a pulpless tooth, even tho it is not a devitalized tooth and even tho it may be negative in the roentgenogram, may be a focus in the production of some chronic disease.

We have not cultured enough teeth to conclude that every pulpless tooth is infected, but our results would indicate that in some cases it is as important to remove these apparently negative but pulpless teeth as it is to remove granulomas.

That bacteria are sometimes present in the pulp of vital teeth has been shown by Collins, and Henrici and Hartzell. We have cultured 35 vital teeth, some from mouths which were being prepared for dentures, but all of the badly infected teeth, with pyorrhea or caries, were extracted from patients with some specific disease. Of the 35 teeth, 15 were negative, 17 yielded pure cultures of green-producing streptococci, and three yielded

streptococci and staphylococci. The fifteen negative teeth were either perfectly normal, contained small cavities, or had a mild degree of pyorrhea. Of the teeth with infected pulps 11 were pyorrhetic where the alveolar process had been destroyed either to the apical third or middle third of the roots, and in the 8 teeth with caries, the cavities were so deep that to prepare the tooth for restorative work would have resulted in exposing the pulp. Only one tooth had an infected pulp in which no caries or pyorrhea was present, but this tooth did not respond readily to the pulp test, as did all other vital teeth in this same mouth, and gave a history of much discomfort several days before the patient had an attack of iritis.

CONCLUSION

It seems from our study that many chronic diseases may often be due to dental foci which harbor streptococci that have an elective affinity for various organs or tissues and that the amount of pathologic process at the apex of a tooth in no way indicates how much of a relationship may exist between that tooth and the patient's systemic condition. The stand to take regarding the removal of certain teeth we believe depends on the case at hand and demands the close co-operation of the physician and the dentist.

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Discussion

Boyd S. Gardner, Rochester, Minnesota: I would like to place emphasis on the importance of surgical asepsis in removing teeth, especially when a specimen is to be obtained for laboratory work. Table toilet is a matter of great importance and we attempt to operate on our patients under a condition similar to that carried out in any major surgical operation. Operating tables are substituted for dental chairs and we find by the use of same that we are able to protect our patients more easily. The wide head rest on the operating table has been found to be far superior to the narrow head rest in carrying out the necessary table toilet. Large sterile towels are used to cover the head and that part of the face which is exposed is washed with a solution of 50 per cent alcohol. Towels are laid across the chest in a V-shaped manner. The field of operation is walled off by sterile sponges and iodin is applied followed immediately by alcohol. In all the cases to which Dr. Meisser referred, the teeth have been surgically removed which operation is now termed alevolotomy. Where large cysts were found the pipette was used while in other cases where granulomata were present they were transferred to the test-tube in such a way as it was practically impossible for contamination. Dr. Meisser emphasized that in many cases a pure culture was obtained which demonstrated the point that the specimen was not contaminated. However, we do not say that we are successful in every case.

When working on the teeth of dogs, we selected the cuspids and found the younger animal to be much better as the pulps were more easily exposed. By having the dog etherized and by the use of the rubber dam it was found that the work could be carried on very similar to work in the human mouth. For the benefit of those who may wish to carry on this type of work, I would say that a good radiogram is rather difficult to obtain until one studies carefully the anatomy of the dog's cuspids.

Weston A. Price, Cleveland, Ohio: I would ask if we understood Dr. Meisser correctly that these animals are etherized on the third day after injection?

Dr. Meisser: The animals injected intravenously were etherized in from three to six days depending on the case studied. If allowed to live for a longer period, the effect of the one inoculation is often overcome. However, the animals in which chronic foci were produced thru the devitalization and infection of teeth were allowed to live for several months.

Dr. Price: What do you consider a lesion—is it always microscopic, or might it be a microscopic process?

Dr. Meisser: In this study we considered those lesions evident to the naked eye and made microscopic examinations of the same. The lesions were very striking. Cultures were made of the lesions and fluids of the body but microscopic sections were not made of all the various tissues where lesions were not evident at necropsy. It is possible that lesions too small to be detected at necropsy were present in some tissues not studied under the microscope.

D. L. Yingling, Johnstown, Pennsylvania: In the case of inflammation of the tonsils and antrum, where the staphylococcus was applied to the pulps of the inferior canine teeth of dogs and an infection was shown there, was that a staphylococcic infection?

Dr. Meisser: The patient had a staphlococcus infection in his tonsils, antrum and mucous membrane of the nose. This same organism was injected into the pulp chambers of the dog's teeth and recovered again at necropsy.

W. P. Larson, Minneapolis, Minnesota: We found the staphylococcus in washings from the antrum, from the mucous membrane of the nose and the tonsils, it was the predominating organism. The other organisms present were, I think, due to contamination.

C. B. Lewis, Ottumwa, Iowa: Have you carried on any work in animals in regard to blood examinations and urinalysis?

Dr. Meisser: We did make a urinalysis of all animals in the nephritis experiments before injection as well as at necropsy but no blood counts were made. Our animals had a normal urine when injected but at necropsy showed leucocytes, erythrocytes, albumin and casts.

J. W. O'Brien, Lawrence, Kansas: How long after injection of the dog did you really get the evidence of granuloma?

Dr. Meisser: I cannot say how soon a rarefied area was produced. The cuspids shown were radiographed at necropsy. Roentgenogram taken several weeks before necropsy did not show as marked evidence of infection.

R. M. Seibel, Kansas City, Missouri: Is there a different coccus that invades the affected tooth? Is there a particular strain of diplococcus here?

Dr. Meisser: We usually recover the same type of streptococci from infected teeth altho in some instances mixed cultures are obtained. However, all types of bacteria present in a mixed culture may not be responsible for the patient's disease and to determine which type of organism is responsible, it is necessary to inject animals. The infecting organism can

usually be recovered in pure cultures from the lesions produced. In cases where vaccines are desired, we determine by this means which strain of organism to use, rather than make it from a mixed culture.

Dr. Seibel: I am referring to heart lesions where the diplococcus is present and that same coccus found in the lung, and in another case where the organism was also the diplococcus, and I was wondering whether there was an affinity there for certain species of the diplococcus.

Dr. Meisser: Because diplococci harbored by infected teeth may be the cause of an endocarditis in one patient does not mean that the same type of diplococci will cause an endocarditis in all patients who harbor such organisms. A streptococci viridans in the infected tooth or granuloma of one patient may acquire a specificity for joints while in others it may acquire a specificity for muscle tissue, kidneys, heart tissues, and so forth. We cannot tell by a microscopic examination what the specificity of certain streptococcus may be.

Two of the experiments which I cited are of special interest because they emphasize more than any others that results in animals are due to the elective affinity of the organisms and not to number of bacteria injected. In the one case, we produced a marked iritis, arthritis and myositis in animals both by intravenous injection and by the injection of but few organisms into the anterior chamber of the eye.

The lesions in the animals injected into the anterior chamber of the eye were as marked as those produced in the animals which were intravenously injected with large doses of the same organism. In the other case we produced nephritis both by intravenous injection of rabbits and by the devitalization and infection of two cuspids in dogs with a staphylococcus from a patient's foci. The condition experimentally produced in these dogs was very similar to that so often found in man, not an overwhelming infection, but only a few infected teeth. The nephritis produced in these dogs from the infections about the teeth was as severe as that produced in the rabbits by the intravenous injection of large doses of the same organism.

THE RELATION OF THE GENERAL PRACTITIONER OF DENTISTRY AND THE PEDIADONTIST

By PHILIP R. THOMAS, D.D.S., Minneapolis, Minnesota

(Read before the North Suburban Branch of the Chicago Dental Society, Evanston, Illinois, January 17, 1922)

THE relation between the pediadontist and the general practitioner is of an entirely different character from that of the other different specialties in dentistry. The radiodontist and the exodontist in referred cases, terminate their relations with the patient in so far as their services are indicated. A case is referred to the orthodontist for a definite service covering the time required to accomplish and attain a certain orthodontic result. During this time, which may be for six months or a longer period, the patient is in touch with his own dentist and returns to him for any required dental service. A patient referred to the pediadontist is in an entirely different situation in that the service rendered by the pediadontist covers a longer period of time than any other referred cases. In other words the patient is referred to the pediadontist for a long period of time for general dental supervision, usually until the age of twelve is reached. In my experience most patients referred to the pediadontist is the unmanageable kind.

Many do not do anything for the children and apparently are not willing to let the other fellow try. Some of the following reasons are given for this attitude on the part of the profession:

Fear of losing the patient forever.

Fear of losing the rest of the family if the children are referred.

Indifference to the welfare of the child.

Lack of willingness to admit that the other fellow has any special ability in the care of children.

A desire to do everything of every kind in dentistry for the family.

A lack of agreement as to the methods of procedure.

Lack of agreement relative to diagnosis for examples as related to orthodontia and time when treatment should be started, or as related to means of eliminating focal infection.

The pediadontist is faced with many problems in relation to patients referred to him. The value of his service is minimized by the attitude of the general practitioner toward children's work. Consequently he must spend half of his time educating parents so that he can get enough for his service to make it possible to continue practice. The following experience will illustrate. A bill of $4.00 was sent to the mother in a case for consultation and prophylaxis. A letter came back saying that the bill was outrageous; that her own dentist upheld her and offered to care for the child's deciduous teeth free of charge. What sort of care would that child get for nothing and how will the dentist pay his bills? Another illustration: Two children presented for treatment accompanied by a governess. They came in a limousine. Consultation, amalgam fillings, and prophylaxis for both was the service given. The bill rendered was $10.00 and $12.00 respectively. A total of $22.00. A letter about as follows was received: "My wife has referred your bill to me for adjustment. After much thought I think the following would be about right:

"Cleaning Bernadette's teeth	$3.00
"Cleaning Frank's teeth	3.00
"Some small fillings	3.00
"Extracting baby teeth which might have been pulled at home	3.00
"Total	$12.00

"I herewith tender my check for $12.00 trusting it may be satisfactory."

What is a pediadontist and what training and knowledge should he have? A pediadontist is a dentist limiting his efforts in his profession to children from infancy to adolescence. He should preferably have some years of training in the solution of the problems arising in general practice that he may know the sequelae or oral conditions as seen in the child's mouth. With such experience as a foundation he should direct his study to all factors concerned in the development of normal dentition and the maintenance of normal oral health. This makes it incumbent on the pediadontist to recognize the diseases of the sinuses, the eyes, ears, nose and throat which are related to his work. Congenital lues, rachitis, dermatitis, malnutrition, otitis media, deafness, iritis, conjunctivitis, stenosis of the nares, diverted septum, and the diseases of the throat are among the many conditions presented in practice, and must be diagnosed for reference to the medical specialist. Nothing widens and broadens the viewpoint of the pediadontist more than visits and observation in the children's operating rooms and wards of hospitals, as well as the private clinics of the medical specialist. A knowledge of the etiology, diagnosis, and sequelae of the diseases of childhood will add largely to the usefulness of the pediadontists. A knowledge of the principles of immunity, oral infection in the mouth of the child in its relation to the health of the child, together with the study of

nutrition and dietetics applies fundamentally to the work of the pediadontist. The etiology and treatment of malocclusion in its incipiency he must be thoroly conversant with, together with oral surgery in its application to children. Pediadontia as I see it, is a much wider field of usefulness than that conveyed to the mind of the dental profession by the term "children's dentistry." This, in the minds of the profession means filling, extracting, and prophylactic treatment of the child's teeth. As I see it the pediadontist to properly function must have a much broader training. He must have a desire and the ability to give to his patients a well-rounded out health service as indicated above, not necessarily all performed by himself but such service rendered through his instrumentality because of proper training and study. Through his interest in children he must become an important factor in the solution of our problem of public oral health education. The pediadontist must concern himself not only with the restoration of mouth lesions including the teeth, but must within the limits of his degree assume his share of responsibility not only for prevention of dental lesions but systemic lesions as well.

In the development of any field of endeavor much trouble may be expected. In all cases the pediadontist must be careful not to say or do anything to undermine or weaken the standing of his fellows. He must be willing to acknowledge his limitations in restorative work in children's teeth. He must be willing to assume responsibility for service rendered. He must study his subject that he may have proper judgment in his work. He must realize that pediadontia is to dentistry, what pediatrics is to medicine. He must visualize the splendid possibilities and opportunties before him for doing a wonderful work for humanity. He must realize that the most virgin field for research in dentistry lies before him and he must strive to develop it. He must give freely of his knowledge and methods to his fellow-practitioners that all children may benefit therefrom. He must be in dentistry the friend of every child. The influence of the love of children, the daily contact with them, the helpfulness of service in their happiness and health can have no other than a refining, uplifting, humanizing effect on any professional man or woman. If the pediadontist truly loves his work and his patients, his relations with his fellow-practitioners can be none other than ethical, upright, and honorable. Most of all that he may properly dignify his special work in the eyes of the profession, he must have ideals, for prevention in dentistry is idealism in dentistry.

DENTAL ENGINEERING

Shall We Adjust an Articulator to Conform to Anatomical and Technical Requirements or May We Expect Our Patients to Fit an Average Articulator?

By RUDOLPH L. HANAU, M.E., Buffalo, New York

(Read before the National Society of Denture Prosthetists, Milwaukee, Wisconsin, August 1-13, 1921)

IT IS the purpose of this paper to bring before you an investigation of mandibular movements and their reproduction in the articulator mechanism from the viewpoint of dental engineering.

Gritman and Snow are among the pioneers in the field of research which is the subject of this paper. These pioneers have leveled the ground upon which Gysi built his wonderful structure, masticatory movements.

The search for the rotational axes and points, to which Gysi correctly refers when elucidating his theory, has started a hunt for the rotation points and axes.

The axes of rotation to which Gysi refers are to be understood as momentary axes of rotation and the locations he shows are most nearly and most frequently to be expected for particular movements. The Hall and Monson theories, so frequently mentioned, are a misinterpretation of masticatory movements as applied to the articulator mechanism. The locations of the axes by Hall and by Monson, and their precursors, are so unfortunately selected that they cause mandibular movement in the articulator, which present distortion of anatomical conditions about the condyles. The movements do not coincide with their respective theories, nor with individual anatomical requirements.

The study of mandibular movements is so intimately connected with the evolution of articulator designs that I cannot but mention these two items alongside of each other. Various articulator designs which we have to deal with are the very expression of the conception of masticatory movements by their respective authors.

The capital question involved always was: Is it permissible to use a non-adjustable mechanism based on averages or should we have an adjustable apparatus to comply with the anatomical conditions and with the technical selections? Under the latter I understand the tooth form and arch form selected. I have come to the final conclusion that it is absolutely necessary to adjust an articulator to comply with given individual requirements. Some of the errors introduced by relying upon averages may be more readily demonstrated by the two-dimensional demonstrator (Fig. 1). Technics to make and apply measurements have been given to the profession by various authors, and to these I have added by introducing new features.

I again call special attention to the employment of the Snow face bow. We rely upon this instrument to establish

correct positional relation of the denture in the patient and to re-establish it in the articulator. There still are too many who do not appreciate the importance of the face bow technic established by Dr. Snow. The establishment of correct positional relation is most essential; if neglected, the situation becomes very complicated. The face bow is the finest, simplest and most elegant contribution to dental metrology. Its usefulness may justly be compared with the ophthalmometer invented by Helmholtz.

I define the face bow as an instrument for determining the *positional relation* of the denture to the condyle line in the patient, and to re-establish said relation in the articulator mechanism. Figure 2 shows a face bow designed by me after Snow.

I maintain that a floating of the condyle heads should occur within the natural limits of freedom of movement of the condyle heads in the glenoid fossa only, and that there is no excuse for grinding-in a denture which will force condyle heads to move beyond the natural space of their freedom of movement. It is therefore of utmost importance to the prosthetist to know the relation between the positions of the dentures in the patient and in the articulator.

Mandibular Movements and Their Components

I have dissolved mandibular movements into ten components, and express each component by a symbol. An entire mandibular movement is given by combining the symbols of its components. The symbols are succinctly arranged in Fig. 3. Column 2 symbolizes movements executed by the lower jaw member in relation to the upper, as is our every day interpretation of masticatory movements. The symbols given in

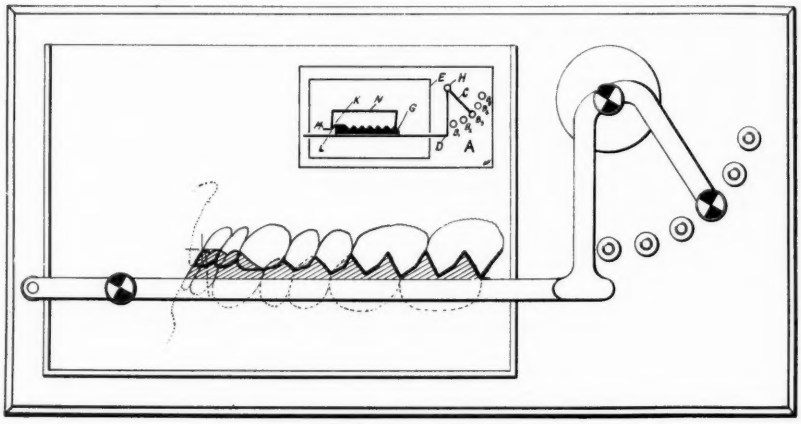


Fig. 1

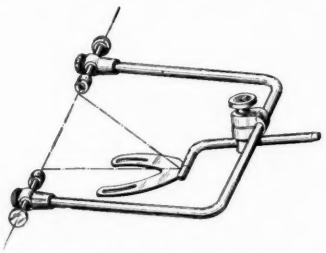
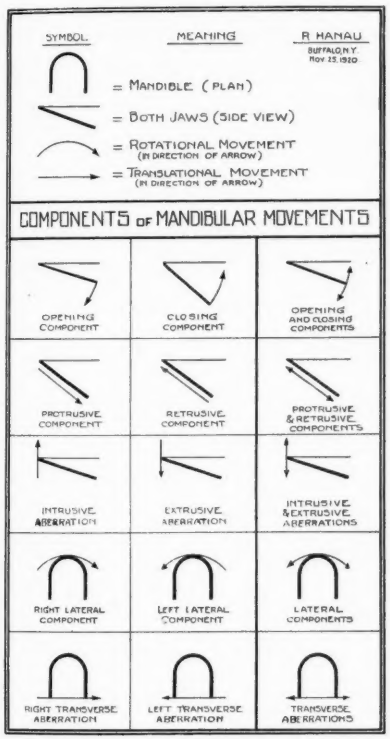


Fig. 2

column 3 are the same components as those in column 2, but the movement of the upper jaw member is referred to the lower. It eliminates confusion, when investigating articulator mechanism, having an upper moving jaw



member and when making comparative analysis of anatomical and articulator movements. It will be noted that the jaw, accepted to be moving, is represented by a heavier line in the symbol employing the < signs. Components which are composed of the ∩ sign are distinguished by employing the arrow → for movement of the lower jaw member, and the arrow ← for movement of the upper.

1. *The opening and closing components* collectively constitute an oscillation about the condyle line.

a *The opening component* is the rotation of the mandible about its own condyle line irrespective of the position of the mandible. The action of the opening component increases the distance between all points of the mandible and the maxilla anterior of the condyle line, and has the reverse effect upon points located posteriorly. The anterior and posterior location is referred to a plane parallel to a momentary movement and thru the condyle line.

b The *closing component* is a rotation reversed to the opening component.

2. *The protrusive and retrusive components* are reciprocating movements of the condyle heads along the condyle paths. These components suffer a disturbance wherever the anterioposterior inclination of the condyle paths is not alike on both sides.

a The *protrusive component* infers a simultaneous excursion of the condyle heads along the condyle paths anteriorly, irrespective of other movements of the mandible which may accompany it.

b The *retrusive component* is reversed to the protrusive component.

3. *Lateral components* are oscillations, and like all other components are considered irrespective of the accompanying movements.

a The *right lateral component* is a rotational movement of the mandible, causing the right condyle head to approach its socket with a greater velocity than the left. Such a definition covers all possible right lateral movements. When the left condyle head leaves its socket, its movement, in relation to the socket, becomes negative, which of course is less than no movement, the latter being the condition of the right condyle head when it occupies its socket. During mastication it also happens that the left condyle head re-

mains stationary somewhere on the path, and the right approaches its socket.

b The *left lateral component* ⋂ is the reverse of the right lateral component.

4. *Transverse aberrations* ∩ are in-

b The *left transverse aberration* ∩ is the reverse of the right transverse aberration.

5. *Perpendicular aberrations* ≮ will hardly occur in short succession at the

COMPONENTS of mandibular movements	SYMBOL Mandibular	Articulator
1. OPENING AND CLOSING COMPONENTS		
a. Opening component		
b. Closing component		
2. INCISIVE COMPONENTS		
a. Protrusive component		
b. Retrusive component		
3. LATERAL COMPONENTS		
a. Right lateral component		
b. Left lateral component		
4. TRANSVERSE ABERRATIONS		
a. Right transverse aberration		
b. Left transverse aberration.		
5. PERPENDICULAR ABERRATIONS		
a. Intrusive aberration		
b. Extrusive aberration		

Fig. 3

separable from the lateral components. Their existence, tho very much in evidence, does not as yet seem to be acknowledged universally.

a The *right transverse aberration* ∩ is a simultaneous movement of both condyle heads laterally to the right, transversing the paths.

same location of the condyle path on account of the mobility of the condyle heads. Aberration is applied in the meaning of component movement.

a The *intrusive aberration* ≮ is the deviation perpendicular to the direction of the condyle path from a theoretical surface equidistant to the surface of the

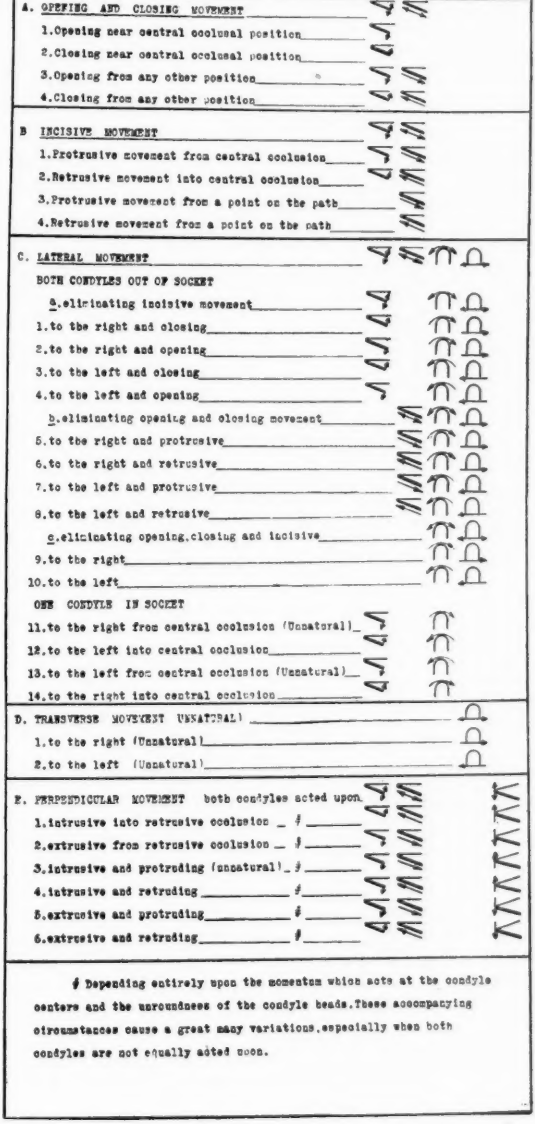

Movements:
Components:
A. OPENING AND CLOSING MOVEMENT
1.Opening near central occlusal position
2.Closing near central occlusal position
3.Opening from any other position
4.Closing from any other position
B INCISIVE MOVEMENT
1.Protrusive movement from central occlusion
2.Retrusive movement into central occlusion
3.Protrusive movement from a point on the path
4.Retrusive movement from a point on the path
C. LATERAL MOVEMENT
BOTH CONDYLES OUT OF SOCKET
a.eliminating incisive movement
1.to the right and closing
2.to the right and opening
3.to the left and closing
4.to the left and opening
b.eliminating opening and closing movement
5.to the right and protrusive
6.to the right and retrusive
7.to the left and protrusive
8.to the left and retrusive
c.eliminating opening,closing and incisive
9.to the right
10.to the left
ONE CONDYLE IN SOCKET
11.to the right from central occlusion (Unnatural)
12.to the left into central occlusion
13.to the left from central occlusion (Unnatural)
14.to the right into central occlusion
D. TRANSVERSE MOVEMENT (UNNATURAL)
1.to the right (Unnatural)
2.to the left (Unnatural)
E. PERPENDICULAR MOVEMENT both condyles acted upon
1.intrusive into retrusive occlusion #
2.extrusive from retrusive occlusion #
3.intrusive and protruding (unnatural) #
4.intrusive and retruding #
5.extrusive and protruding #
6.extrusive and retruding #
Depending entirely upon the momentum which acts at the condyle centers and the unroundness of the condyle heads.These accompanying circumstances cause a great many variations,especially when both condyles are not equally acted upon.

Fig. 4

condyle path. The distance between this theoretical surface and the condyle path is the accepted radius of the condyle head. The intrusive aberration is due to the change of the radius of the condyle heads and to the resiliency and unevenness of the fibro-cartilage.

b The *extrusive aberration* ⋉ is the deviation reversed to the intrusive. A maximum may be found about the middle of the condyle path, when the condyle radius increases and when the mandible performs a protrusive excursion. I would expect an increase of the extrusive aberration with the increase of the horizontal inclination of the condyle path.

The most important masticatory movements, as they are generally spoken of, are enumerated in Figure 4 under heading "Movements." Under "Components" we find the components of the dissolved movements. The symbols vividly illustrate the complexity of some movements which we commonly refer to by one designation.

If we accept two more symbols ○ measuring this point of the mandible not affected by the movement, and ● appertaining to movement of this point of the mandible only, then we will be able to make very fine differentiations in elucidating masticatory movements, e. g. ⋂ (unnatural)[1] designates the lateral component to the right and the right condyle head in rest position is unnatural, and ⋂ when ≺ means a lateral oscillation affecting both condyle heads, possible only when both jaws are separated.

≺ (natural near) ≺ but ≺ (unnatural) ≺ indicates opening and closing movement not affecting the position of the condyle head is natural near a position of closed jaws (central occlusion), but unnatural when the jaws are separated. There are no limits for useful application of these symbols in classrooms by teachers.

[1]It is associated with partial ankylosis.

With the eight components, it is possible to make 255 different combinations without repetition. Considering also the perpendicular aberrations 1023 different combinations are possible. For instance with three components *a, b, c,* we have seven different combinations without repetition, but if we permit repetition of the components in different order we have fifteen variations. For eight components there are 441 624 960 variations, while for ten components, 2 810 408 198 400 are possible.

The following formulae are used for calculations:

$S_1 = 2^n - 1$, and $S_2 = n\,[2\,(n-1)! + (n-2)! + \ldots + (n-n+1)!]$

Freedom of Movements of Mandibular Points

All points of the mandible have freedom of movement in all three dimensions. These may be investigated by referring them to any co-ordinate system. Gysi, who has chosen the rectangular co-ordinates, has given us the most succinct and correct data. I have chosen Gysi's work as a basis.

Gysi has demonstrated that the incisal contact point has a freedom of movement within a figure known as the Gothic arch. This figure is intended to illustrate the movement of the contact point of the centrals in relation to a plane, which approximates the so-called occlusal plane, the latter being arbitrarily related to the maxilla or points thereof. Figure 5 relates the familiar arbitrary triangle representing the maxillary triangle, and an arbitrary ellipse representing the lower dental arch to the mandible. The base line B C of the arbitrary triangle is the connecting line of the centers of the condyle heads, and the apex *A* is accepted at the contact point of the lower central incisors. Bonwill accepted the mandibular triangle in relation to the contact points of the upper central incisors. The arch ellipse *D A E* is assumed thru

the contact points of the teeth. A surface laid thru this ellipse approximately coincides with the so-called occlusal plane. An ellipse has been selected because it is a geometrical figure resembling the arch form and, is very convenient and flexible in design.

Figure 6 is an extension of the Gysi Gothic arch into three dimensions. The spatial figure may be known (for want of a better name) as the medium-bicus-

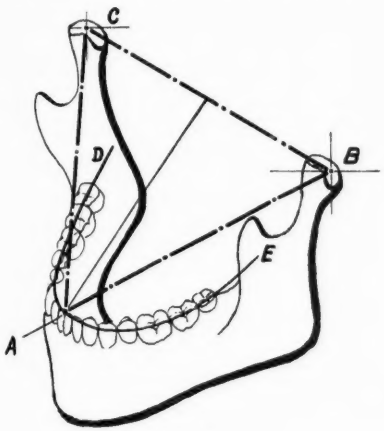


Fig. 5

poid.[1] Any point on and within the surfaces of this bicuspoid is a possible position for the contact point of the lower centrals during mandibular movements. All other points of the mandible have also freedom of movement within bicuspoids, which are geometrically related to the one here shown.

Bicuspoids have five surfaces more or less curved: two superior surfaces, two posterio-lateral surfaces and one anterior surface. The posterio-lateral surfaces unite in a ridge and the two superior surfaces along a fossa, etc. Toward the condyles, these bicuspoids become much distorted, and the individual surfaces less distinct.

Figure 7 illustrates several bicuspoids, the median bicuspoid and others for points in space, not necessarily of the mandible.

The condyle bicuspoid (Fig. 8) for all practical purposes may be substituted by two extreme surfaces, almost equidistant to the condyle surfaces. Between these surfaces, which intersect in the retrusive

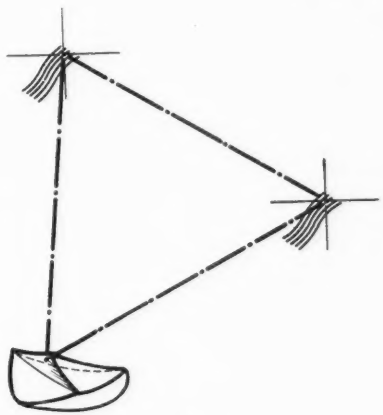


Fig. 6

positions of the center of the condyle sockets, we find all possible positions of the condyle centers for masticatory movements. The space, just described, is that occupied by the condyle bicuspoid, and the condyle movement which Gysi records is a lateral projection of this bicuspoid. It is an average representative of the lateral projection of condyle movements. The upper surface of the condyle bicuspoid is of primary interest to the prosthetist in grinding masticatory surfaces.

The height and the transverse dimensions of the bicuspoids decrease for points approaching the condyle head. These themselves are able to move on path surfaces, almost equidistant to the

[1] "Bicuspoid" is derived from "bicuspid", the formation being bicuspid-like; "bicuspidoid" may be more correct.

condyle path itself. The equidistance is somewhat disturbed by the perpendicular aberration and by the shape of the condyle head, which is *not* a rotary formation. The dimension of the bicuspids remain constant in the direction of the incisive components.

It must be kept in mind that any point without the mandible in definite geometrical relation to the mandible has its corresponding bicuspoid. Within this bicuspoid it can move in relation to the maxilla. The pin and incisive guide of many an articulator design are

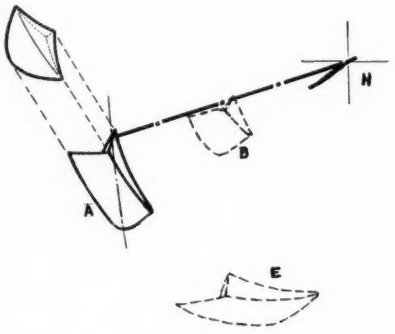


Fig. 7

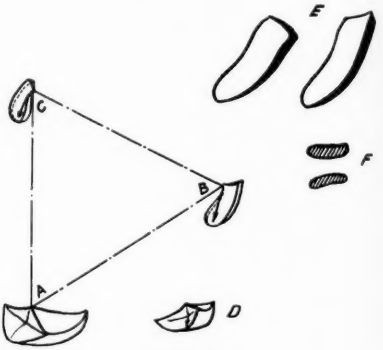


Fig. 8

illustrations of the importance that should be given to points related to the masticatory apparatus, not necessarily within its own spatial extent.

If we confine our attention to the movements of any three points definitely related to the mandible and relate the movements to the maxilla, and produce an apparatus which will permit equivalent mandibular movements, then we have an articulator.

The Floating Condyle

The condyle path is a fragment of the maxillary masticatory surface; upon it operates the condyle head, the latter being a fragment of the mandibular masticatory surface; between the two we find the fibro-cartilage, acting as cushion and lubricant.

We understand that the process is subject to absorption, and regeneration notably during the period of natural development of the dental apparatus, and not confined to this period. However, we assume that there is a limit within which nature accommodates without causing physical defects or pathological conditions and consequent inconvenience. This limit has not been determined and cannot be determined with mathematical accuracy.

We know from observation that inconvenience is caused to the patients by ill-fitting dentures, which unduly tend to dislocate the condyle heads from a space within which natural mastication requires a freedom of movement of the condyle heads in their cavities. This space, within which freedom of movement of an accepted center of the condyle head takes place, was described as the condyle bicuspoid. I do not for a moment deny the existence of bone absorption and bone regeneration, which nature so charitably has instituted, but maintain that the prosthetist should know "when and where" he wants to stimulate a change of the process and "how" he may do it. I am absolutely opposed to the hit-and-miss method which does not diagnose, analyze nor apply the best, because it is an acknowl-

edged fact that physical defects of the dental apparatus and pathological conditions have been caused by and traced to ill-fitting plates.

The influence upon denture and condyle surface is reciprocal. It is both fortunate and unfortunate for us in many ways that the artificial denture is made to rest on tissue which itself is resilient and subject to absorption. I know that this state of affairs makes it difficult to measure "very" accurately, which I am accused of recommending Yet I maintain that existing anatomical conditions should be measured directly or indirectly with that accuracy which is possible and within practical reach. Indirect relative measurements are very practical and if carefully made most reliable.

To illustrate the floating condyle, I have thought out the following device (Fig. 9). It consists of a base made of clay or putty representing the bony wall of the glenoid cavity. The greased rubber sheet takes the place of the fibro-cartilage, and the ball at the end of the rod, that of the condyle head. The ball end has freedom of movement on the surface of the rubber sheet, equivalent to the condyle head movement upon the fibro-cartilage.

The so-called floating of the ball end (condyle head) takes place along and perpendicularly to the rubber sheet (fibro-cartilage). A free movement along the surface occurs when no pressure is exerted. A movement perpendicular to the surface sets in as soon as a perpendicular force acts and the ball end is either lifted off the rubber sheet or pressed into it. Any pressure within the limits of elasticity of the rubber and within the limits of resiliency of the clay below has no lasting effect. A pressure above the limits mentioned will cause deformation. Similar conditions apply to the bone structure of the condyle head and of the wall of the condyle fossa. Too great a pressure causes bone absorption and too little or a negative pressure results in bone regeneration ordinarily. Both absorption and regeneration occur very gradually and invariably create inconvenience to the patient. Is that the "floating" which the prosthetist desires?

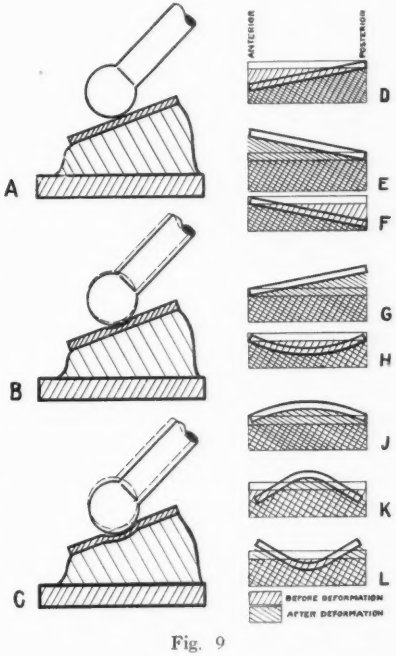


Fig. 9

It is quite easy to determine with the aid of check bites, the distribution of pressure which must be expected from faulty occlusion in the different positions of articulation.

If we assume the same muscle action for defective occlusion then the following change in distribution of forces occurs:

Bite	Intended Occlusion	Pressure Distribution in Fossa	Pressure Distribution in Mouth
Open posteriorly	Central	Increased posteriorly	Increased anteriorly
Open posteriorly	Protrusion	Increased anteriorly	Increased anteriorly
Open anteriorly	Central	Decreased posteriorly	Increased posteriorly
Open anteriorly	Protrusion	Decreased anteriorly	Increased posteriorly

Faulty distribution or pressure by defective occlusion or unsatisfactory plates invariably stimulates bone and tissue changes. The check bites indirectly serve as a means to find out whether the condyle movements were correctly adjusted in the articulator mechanism. It is evident that a denture correctly articulating in the articulator, will of necessity correctly articulate in the mouth only if the articulator has been correctly adjusted.

If a denture correctly articulates in the adjusted articulator but shows defective occlusions in the mouth, then the articulator should be readjusted to *compensate* for these defects.

Their exists a reciprocal relation between the tissue changes in the mouth and the bone changes in the glenoid fossa. Unless the relation of the respective changes are thoroly studied and understood, the period of accommodation of the artificial denture to the patient's existing masticatory function is unduly prolonged. The reciprocal relation may very readily be studied and demonstrated by statics by accepting the jaws as moving levers upon which the forces of mastication are exerted by the muscles and distributed by the plates and the condyle heads. Tho we are not able to establish rigid formulas which apply to individual cases, it may be stated that it presents no particular difficulty to follow up the conditions which pertain to a hypothetical case.

The advance of surgery has accomplished the feat of amputating the condyles to eliminate the handicap of ankylosis. The operation re-establishes the possibility of performing mandibular movements after a fashion.

The resulting masticatory function is abnormal in every respect. An entirely different co-ordination of the magnitude and direction of muscular forces is the result. It is but an example of nature's wonderful adaptability to master a most intricate instability.

Natural Dentures Versus Artificial Dentures

In earlier readings I have shown that natural mastication is not identical with artificial mastication. The only part of the edentulous mandible which moves or attempts to move in exact compliance with natural dictates is the condyle head in the glenoid fossa, anterioposteriorly, laterally, as well as in opening and closing.

The magnitudes of these movements suffer a change unless incidentally a duplicate of the natural denture has been made and provided no bone and tissue changes have taken place about the condyles during the past, toothless period. Usually artificial dentures are made for patients, who have not been under the constant care of the dentist and whose records are not available. Thus we are confronted with fragmentary, often mutilated, remnants, which may evidence that the original masticatory surfaces were different. It is right here that the prosthetist will analyze and diagnose his case to determine the course he must pursue. No so-called anatomic, automatic or adjustable articulator will fill the gap which has to be bridged by concentrated analytic and constructive thinking.

I will endeavor to give in short the most prominent characteristic of natural and artificial mastication and sum up

the requirements for increased efficiency of artificial mastication.

The pressures during natural mastication are transmitted to the jaw by teeth, well rooted in the gum, while pressures during artificial mastication are transmitted by plates, which present no anchorage equal to that of the rooted teeth. We therefore cannot expect that masticating forces are as efficiently utilized in artificial dentures as they are in the natural.

Depending on the formation of the gums upon which the plates are seated we should decrease the masticatory components in the directions which offer a minimum of anchorage and if necessary or advisable increase in the direction of maximum anchorage. In other words we must build a compromise denture and effect compromise articulation. To accomplish this we must be acquainted with the relation between condyle guidance tooth position and and tooth form. These are purely statical and geometrical considerations, which must be harmonized to comply with the complicated kinematical requirements of mastication. The tooth form and arch form in conjunction with the condyle path must constitute a harmonious structure which permits articulation. The condyle guidance is given by the patient; it may require modification in one direction or another. This is a question to be decided by the prosthetist and not by any thumb rule, or an articulator mechanism.

Next in order is the selection of tooth form. The various forms available in the market offer a splendid variation from which to select for most requirements. The arch form, I venture to say, should be a resultant of the determined or accepted condyle paths, of the selected tooth type, of the ridges, where they are placed and finally of the kinematical requirements. To comply with the latter we need the articulator mechanism, the patient's dummy.

Articulators

A dental articulator is a device executing mandibular movements for the purpose of assisting in setting up and grinding in artificial teeth.

We distingush the plain line articulator, arbitrary movement articulator, average movement articulator, semi-adjustable articulator, adjustable articulator.

Plain line articulators are frequently employed in partial denture reconstruction to establish occlusion. They execute an arbitrary opening component movement and consist of two vice jaws hinged in the back. Adjusment of the position of one jaw or both jaws in relation to the hinge axis by means of lock screws is usually provided for.

Arbitrary movement articulators permit the execution of two or more mandibular component movements in arbitrarily accepted directions.

Average movement articulators execute movements determined or accepted by their originators as averages.

Semi-adjustable articulators permit adjustment of direction of at least one articulator movement to conform with mandibular component movements of the patient.

Adjustable articulators permit adjustments of all articulator movements to conform with mandibular movements of the patient. Adjustment must be possible within measurable limits. The measurements may be directly or indirectly made.

It is often very difficult to distinguish between arbitrary movement and average movement articulators. As a rule it will be found that both types are equally untrustworthy. Their universal application is based upon false economy and misunderstanding of the articulator mechanism and of masticatory requirements.

Articulators employing gauges for placing the dentures in the articulator are ranked with arbitrary movement articulators, for the omission of cor-

rectly placing a denture is equivalent to altering the direction and magnitude of movement beyond control of the operator. I have given an analysis of the relation of articulator to mandibular movements previously before the American Institute of Dental Teachers.

We all know and admit that living bone and tissue cannot and should not be measured in centesimal parts of a millimeter, but the millimeter and often the half-millimeter and sometimes less are within practical reach on various mandibular measurements. In the table is given the limits of accuracy we may expect, when making mandibular measurements. Errors within these limits are negligible or may be corrected indirectly.

Measurements	Limits
Position of condyle socket center	2 mm.
Angular deviation of maxillary condyle line	3°
Angular deviation of occlusal plane	3°
Distance of incisal contact point from condyle line	2 mm.
Horizontal inclination of condyle movement anterio-posteriorly	5°
Horizontal inclination of condyle movement laterally	10°
Inclination of lateral excursion of condyle head from socket anterio-posteriorly	10°
Diameters of teeth	0.05 mm.
Contact of teeth during articulation in articulator	0.10 mm.
Angles of tooth cusps	15°
Angles of worn tooth cusps	5°
Tissue compression with new plates in mouth	0.50 mm.
Lateral excursion of condyle heads	0.50 mm.
Tooth relation in one jaw (horizontal	0.10 mm.
Tooth relation in one jaw (vertical	0.20 mm.
Tooth relation in two jaws (horizontal	0.30 mm.
Tooth relation in two jaws (vertical	0.10 mm.
Inclination of tooth axis	arbitrary

By direct measurements we mean those made by means of calibrated instruments; they are absolute and expressed in length, area, space, degree, etc.

Indirect measurements are made by establishing relation of two or more objects. These measurements are relative. As example of indirect measurements, I quote the face bow, the occlusal rim and wax bite technics. It will be found that indirect or relative measurements are the more convenient and practical in conjunction with many mandibular measurements.

We use the face bow to establish the correct positional relation of the denture in the articulator. The face bow extensions are fitted into bores of nuts B_1 and B_2 (Fig. 10).

To adjust the horizontal and lateral inclinations in the articulator we use wax bites. These were taken in right and left lateral occlusion and for checking purposes also in protrusive occlusion. The bites should not be taken in extreme occlusal positions.

We use the right lateral bite to adjust the horizontal inclination of the left forward, and of the right lateral condyle movement, because in this occlusal position the right condyle head moves on or near the maxillary condyle line only, while the left condyle head has made an excursion anteriorly from its socket. Equally we determine with the left lateral bite the inclination of the right forward and the left lateral condyle movement. We manipulate the levers A_1 and A_2 until the occlusal rims seat themselves securely into the wax bite.

To adjust the *right horizontal inclination, we use the left lateral bite* and manipulate the lever A_1 on the right side until the occlusal rims seat themselves into the wax bite and establish correct left lateral occlusion in the articulator. For determining the *left horizontal inclination, we use the right lateral bite* and adjust the left lever A_2 until we establish right lateral occlusion. Both levers are securely locked by locknuts C_1 and C_2 and B_1 and B_2. It is suggested that during these adjustments the locknut E of the back

center socket is loosened to eliminate lateral interference.

An adjustment of the center socket *E* changes the magnitude and direction of the lateral movements in relation to those of the incisal contact point. A backward adjustment of *E* increases the magnitude of lateral movements and decreases the forward-backward inclination of lateral movements of mandibular points posterior to the central incisal contact point and vise versa.

of these components. It will be noted in Figure 11 that the change in position of socket caries the rotational point in the direction of the adjustment. The inclination of the condyle plate F_1 (Fig. 10) is also adjustable by rotating the latter.

The rotational point so-called is to be found on a perpendicular to the intersection of the surface of F_1 with the drawing-plane. The intersection of the perpendicular lines to the directions of

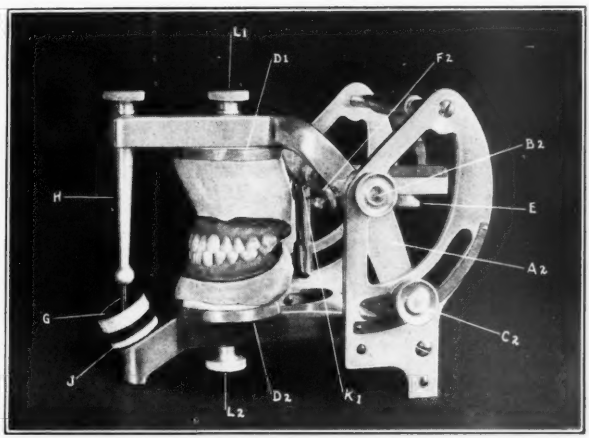


Fig. 10.—A_1 and A_2, right and left condyle levers. B_1 and B_2 right and left bores for face bow. C_1 and C_2 right and left locknuts for condyle levers. D_1 and D_2 cast plates. E, center socket. F_1 and F_2 right and left condyle socket wall plates. G, incisal guide. H, incisal pin. J, locknut for incisal guide. K_1 and K_2 and left condyle socket supports. L_1 and L_2, locknuts for cast plates.

It is erroneous to consider this center socket as a common central rotation point. *E* being movable anterioposteriorly in conjunction with the articulator condyle centers becomes a rotational point of a moving system only. The mandibular member of the articulator is guided directly in the condyle surface plate F_1 or F_2 and the incisal guide *G* and is indirectly guided by the center socket *E*. The common rotational point of the components of movements in a plane is given by the intersection of the perpendicular lines to the directions

the movements is the common rotational point for the components under consideration. By adjusting the inclination of the surface of F_1 (Fig. 10) we are at liberty to change the position of the rotational point laterally. Plates F_1 and F_2, having an inclination of 15°, as are at present provided in the articulator, enable us to adjust the location of the rotational point in the drawing-plane within the shaded area shown in Figure 11.

We may use the protrusive bite to check the adjustments of the horizontal

inclinations of the condyle movements in the articulator.

The incisal guide *G* is detachable and adjustable and is secured in position by locknut *J*. The cavity is selected to harmonize with the tooth form and arch form. Opening and closing of the bite is accomplished by adjusting the guide up or down, respectively.

No undue forces or resistances interfere with sensitive operation of this articulator, due to the fact that *constrained* movements are employed to guide the condyles while the incisal guidance consist of a pin upon an open guiding surface.

In the conclusions to follow, I sum up the results of my investigations pertaining to mastication and articulators.

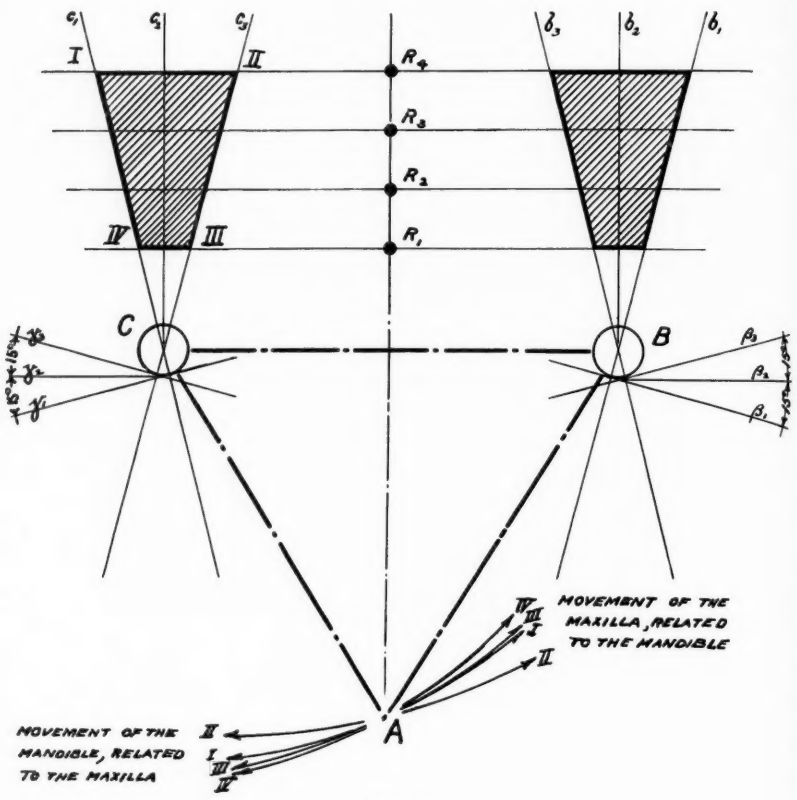


Fig. 11

Conclusions

1. Points of the mandible gave freedom of movement within bicuspoids.
2. Articulation occurs upon the superior surfaces of these bicuspoids.
3. Occlusion consists of multiple point contact of the two opposing masti-

catory surfaces, in any position of articulation.

4. A very complex relation exists between masticatory surfaces and arch formation.

5. Mandibular movements are dissolved into their components to enable exact analysis.

6. Ten components of mandibular movements are considered.

7. It is obsolete, to expect articulation of two arbitrarily chosen and occluded arches, without due consideration of the relation of the arch form and the occluding surfaces to the condyle formation.

8. Mandibular movements do not occur about a point or an axis permanently related to the maxilla.

9. Mandibular movements of natural dentures and artificial dentures are not identical.

10. Articulator and anatomical movements need not be identical, but must be equivalent, in order to procure correct grinding in the articulator.

11. Articulators employing arbitrary or average movements are inadequate. because they do not grind-in teeth to comply with individual requirements.

12. Articulators employing arbitrary gauges or jigs in definite relation to a jaw member should not be used, because a gauge does not establish correct positional relation.

13. A technic employing the face bow and the wax bite method is recommended.

14. Articulator articulation must be directed by three guiding surfaces to produce movements equivalent to anatomical articulation.

15. An articulator employing two constrained and adjustable condyle path guiding surfaces and one adjustable, interchangeable incisive guiding surface, is advocated.

16. An articulator must be adjustable to comply with anatomical and technical requirements.

17. The direction and magnitude of the condyle movement must be adjustable to comply with anatomical requirements.

18. The direction and magnitude of the incisal guidance must be adjustable or interchangeable to conform with technical requirements.

19. Technical requirements are those given by the formation of the artificial masticatory surfaces.

In closing permit me to express my thanks to Drs. Martin Dewey of New York, H. E. Reynolds, E. J. Farmer of Buffalo and to Mr. J. L. Stern, my associate, for the generous assistance extended to me in the preparation of this paper.

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BANQUET TENDERED JOHN P. BUCKLEY, Ph.G., D.D.S., F.A.C.D.

(By the Chicago Dental Society, at the Drake Hotel, Chicago, Thursday, January 19, 1922. Edgar D. Coolidge, president of the Chicago Dental Society, acted as toastmaster.)

The Toastmaster: We gather here tonight to celebrate another of the annual banquets of our society and to honor one of our members who has been with us for many years, and whose honor we are sharing with another society at this time. There are gathered here tonight men from every section of this country, men of prominence who represent the highest in dentistry. There are among those present some who taught our guest of honor in his college days. There are many of his classmates who are present. There are members of the faculty of the school with which he has been connected for many years. There are hosts of his students here tonight, and we are all his friends. There are others who are with us in spirit who are unable to be with us personally, and I take great pleasure in reading communications from two of these. Other communications will be read later on during the evening. The first is a telegram which I received this afternoon, as follows:

DEAR DR. COOLIDGE:

It is with sincere appreciation of the fact that the Chicago Dental Society is tendering this testimonial banquet to my father that I send this telegram to express my regret at not being able to attend. I consider this to be one of the greatest honors that can be bestowed on any man, especially when tendered by an association like the above named.

Again expressing my regret and my inability to attend, I remain,

CLARENCE E. BUCKLEY.

The letter reads:

DEAR DR. COOLIDGE:

Until today I thought I would have the privilege of accepting my brother's kind invitation to attend your banquet, but a matter of great importance came up at the last moment which will deprive me of that pleasure. I cannot, however, refrain from sending you a brief message which I will ask you to read at the proper time.

John's recent election to the presidency of the National Dental Association, and the courtesy and honor you are showing him tonight are a splendid tribute of the esteem in which he is held by the dental profession and by your Society. While his success in life is due largely to his advanced thought, initiative and persistent effort, yet I attribute part of it to the inspiration and influence of the men who surround him at this banquet table. John, as you know, is a man of excellent character, a good dentist, and a loyal friend, but best of all, he was a splendid son to his parents and is a wonderful brother. Mere words cannot express the esteem I have for him, and in behalf of his brothers and sisters, I would like to say in a most humble way that we most sincerely appreciate what you have done and thank you, his friends, for all the inspiration, that you have given him, which is reflected thru him upon us, for which we are all grateful.

Again regretting that I am prevented from sharing the pleasure of this night with him and with you all, I am, most sincerely his brother,

(THOMAS) JOSEPH L. BUCKLEY.

Dr. Buckley, at the banquet tendered to you in Los Angeles the statement was made by the Toastmaster (Bert Boyd) that misfortune had brought you to their midst, and that you had been an enrichment and a blessing to them. What a beautiful tribute to pay to a man, and how true I know that to be! Dr. Buckley, it has been the same with us here. While you have been away from us and journeyed westward, you left with us an impression of your personality which has remained with us. Even tho you are away, that impression of your personality is almost a

living image, to those who know you best and to those who were most intimate with you, because of your kind acts, your thoughtfulness of others, your loyalty, your sincerity, and your devotion. I have heard you speak a number of times in public when you have said that you did not claim all of the honor that came to you as being yours; that you did not claim it as entirely your own; but that it was partly, at least, due to the kind efforts and inspiration of Mrs. Buckley.

Mrs. Buckley, we are more than pleased that you are with us tonight. You honor us by your presence. You and the other ladies gathered here give this occasion grace and beauty. I should like to say, as Dr. Buckley said before, that to none of us alone comes these honors rightfully, but to ourselves and those dearest to us, especially our wives, because it is by their patience and interest and their efforts that we are able to accomplish what we do. Our wives are many times denied the opportunity for association, the opportunity for expression because of duties at home, but the part they play in any success we may have or in any honors that may come to us is greater than we realize and I regret we do not express it as often as we should and as often as we feel it. Because of this kind influence and because of this inspiration, we are led to the highest ideals, and we are led to make our greatest efforts. Ladies, "we admire you for your beauty, respect you for your intellect, adore you for your virtue, and love you because you cannot help it."

The first toast on our program tonight will be responded to by a gentleman who comes from a part of the country where Dr. Buckley has made his new home. He comes from that section of the country which is known as the land of sunshine and flowers, where they need no umbrellas.

Dr. Benbrook does not need any introduction to an audience in his own section of the country, for he has been the secretary of the Dental Society of Southern California for five years and then became president. He made the nominating speech at Milwaukee by which our honored guest was elected President of the National Dental Association. Aside from all this, he is chairman of the Local Committee of Arrangements and is going to make the meeting of the National Dental Association a great success in his own section of the country.

Dr. John P. Buckley and the Pacific Coast

By Charles M. Benbrook, Los Angeles, California

This subject which has been assigned to me tonight, is a very dear one to me. In fact it is doubly dear, it is dear because I have a dear friend in Dr. Buckley, and I have a dear home on the Pacific Coast.

I desire to have it distinctly understood that I have not come to Chicago as an orator, but I consider it my duty as the only representative of Southern California, to speak in behalf of that section of the country, and to tell you how much we love Dr. Buckley.

The only difference between Dr. Buckley and myself is this, he is an adopted son and I am a native son.

I rejoice in seeing honor bestowed upon Dr. Buckley for the great and efficient work which he has given for years to his profession. We have not waited until he has passed into the great unknown land, to show our appreciation of his worth by extolling his many virtues and placing garlands of beautiful flowers on his final resting place. Neither have we waited until he has become a man in his dotage. He is a man in the prime of life, possessing all the faculties with which God endowed every normal human being, and consequently he is able to appreciate what you have done for him, and the high esteem in which you hold him.

As you know, Dr. Buckley is an adopted son of California, and if you

will pardon me I will call him John. In our dear home in California, John said to me: "Charlie, I am going home. I want you to go with me. I want you to see the environments and surroundings in which I have lived for many years. I want you to know the men who have assisted in educating me, to know my friends and those with whom I have been associated in the pursuit of my profession and as an educator." And so I have come, and I have found out that it was here that he was educated for his profession, that his life was molded and made. That here he was taught that when a man becomes worthy he will command a certain station in life and if he makes good, more responsibilities are placed upon his shoulders, and still more until he is weighted down. If he is a man of quality, a man of endurance, his shoulders will broaden and he will be able to carry these extra responsibilities. Dr. Buckley has also been taught, and applies it, that if you love your fellowmen, you will not say to him, What must I do for you, but what can I do.

He has been molded, by being a student, into a man of excellent and rare judgment, wonderful executive ability, a love for his fellow-men, an educator of national repute, a loyal citizen, and a loving husband and father.

These various attainments constitute wealth, and in speaking of wealth, I shall again refer to the Pacific Coast, or the Great West, as a wealthy section, but its wealth does not lie in dollars and cents.

The greatest wealth which a man can have is the possession of the qualities which make a real man, the essentials which make a good citizen, and good citizens make a great country like our United States.

In the early days when gold was first discovered, there was a great rush to California. The pioneers crossed the western plains with their teams of oxen, with dangers from the red man lurking at their heels day and night, deprived of comforts and luxuries of life, enduring all forms of hardships. Many of them sacrificed their lives, their bones left to bleach upon the plains with those of the buffalo. These pioneers became successful not thru money, but by a wealth of endurance and perseverance.

On reaching the land of gold, many were disappointed in quest of the precious metal, but among them were men who possessed a wealth of looking into the future, and saw the great possibilities of that country with development.

And later there came another class of men who possessed a wealth of learning, and then finally there came the class who possessed money, the financiers. But the great western empire was built upon endurance, optimism, and good qualities, not money.

The time came when Dr. Buckley came West. He came poor in health, but he came with a wealth of knowledge, and wisdom, and the ability to apply it. Since he has been there, altho he was fairly well known by the profession before he came to dwell with us, he has become better known.

His excellent judgment coupled with years of experience as an educator and successful practitioner, has been a stimulus to California men. What Dr. Buckley has, he has given to us freely; he has smoothed out little rough spots which existed in different sections of the country.

He has been an inspiration to the young men as well as the old, and one of the inspirations which we received from Dr. Buckley was that, as a western country, with a large representation in the National Dental Association, we were entitled to a National Dental Association meeting.

A few of us in the city of Los Angeles, with Dr. Buckley as the man to guide us, formed what we called a boosters' committee, of which I was made chairman. The committee went to New Orleans in 1920, the meeting place of the National Dental Association for the purpose of inviting the National Dental Association

to hold the meeting in Los Angeles in 1921. But our good friends from Milwaukee desired it, and we stepped aside, for which we are very glad. We extended an invitation to the National Dental Association to meet with us in 1922, and last year we went to Milwaukee as a delegation from California to make plans for the 1922 meeting.

With all due respect to the profession of California, or of the West, there has not been one man to my knowledge, who has been big enough—and I speak from experience regarding men—to place before the National Dental Association for the presidency as a western representative. Dr. Buckley was an inspiration that we, from the West, who had never had the presidency, were entitled to; and as you know, a Californian takes all he can get. We asked for the presidency from the West, and the logical man for the place was Dr. Buckley, because of his rare judgment, his executive ability, his long association with the National Dental Association, which made him duly qualified to discharge the duties of that exalted position, and Dr. Buckley was elected.

I do not know just how long Dr. Buckley will be with us in California. At the present time, it is your loss and our gain. If he were to return to Chicago, it would be our loss and your gain. But if he should ever leave California, he will return wealthier than when he went, because he will have the whole western country filled with admirers and friends.

I do not know that there is a great deal of difference between the state of Illinois and that of California, with but a few exceptions.

As the days, months, and years go by, we are growing older. The sun of my life is getting farther in the west, and the shadows are growing longer, and perhaps in a few years thru infirmities, my activities in a professional way may be dulled or stopped. At that particular time, I will have an opportunity to indulge in reminiscences of my life, and I will think whether or not my life has been a failure or a success, and I will perhaps begin to analyze it; and I will think of mistakes I have made, and I have made many, but there will be a ray of sunshine which spreads like the sun on the dew; for one of the bright, happy spots in my life will be that I had the honor to be here tonight to speak for the West regarding Dr. Buckley. And just as long as the great rock-ribbed mountains in the West, with their snow-capped peaks, majestically reared to the starry heavens of California, stand as silent sentinels over the great western empire, and just as long as the Pacific waters dash and break upon the rock bound coast, and just as long as the great undulating valleys which extend from the mountains to the sea, are covered with a riotous coloring of wild flowers in the springtime, just so long will the influence of our adopted sons, like Dr. John P. Buckley, increase and strengthen the art, the science, the literature, and the commerce of the great western empire.

The Toastmaster: There is one great man who is absent but who, I am sure, is with us in spirit, and I would like at this time to call upon C. N. Johnson to read his message from Truman W. Brophy.

C. N. Johnson: Our Toastmaster has made the statement that California is the land of sunshine and showers; that you do not need an umbrella. I am going to say that by the old Harry, you need a boat sometimes. (Laughter.) There is some hope. We have just heard the distinguished gentleman from California make a speech, and it is the first time I have heard a Californian acknowledge

that there was anything in common between Illinois and California. I am growing hopeful.

Palm Springs, Cal., January 13, 1922.

MR. TOASTMASTER, LADIES AND GENTLEMEN:

Once more I find myself deprived of the pleasure of being in Chicago at this the banquet season.

I left the wind and snow and rain and cold, and now I am at Palm Springs, California, on the glorious Colorado desert, one hundred and sixteen miles east of Los Angeles, where we have only four and a half inches of rainfall annually, and where the sun shines three hundred and fifty days yearly. But you may ask, "What has this to do with Buckley?" It has a lot to do with him. He, too, was ill, and, seeking a place where he could recover his health, came to California and that is why he is with you tonight. Thank God for what California has done for Buckley.

I first knew him shortly after he entered upon the study of his profession in the Chicago College of Dental Surgery, in 1896. As a student, Dr. Buckley's unusual activity and faithful application to his studies attracted my attention. On entrance to the college, he was a graduate in pharmacy, so that as a student he became an assistant in the chemical laboratory. Here his ability was further tested and so well did he do his work that I suggested to Dr. Harlan, then professor of materia medica and therapeutics, that after graduation Buckley would make him a valuable adjunct professor. Later, I urged his appointment and he was so appointed in 1904. When Dr. Harlan moved to New York and resigned his professorship, no one thought of any other man than Dr. Buckley to be appointed to his chair. He was appointed by acclamation and holds the position still.

Buckley's face stamps him as an honest man. His personality carries to all the heart throbs, the impulses of love for his fellow-men. His career has been marked by high ideals professionally, and by virtue of his attributes and achievements, together with his good fellowship, he has been repeatedly honored by his confreres until now he has only one step to take to hold the highest honor in the gift of the profession of the United States of America.

Best wishes to you all, and all honor to Dr. Buckley.

TRUMAN W. BROPHY.

The Toastmaster: The next speaker on our program is a very active man, a man who always contributed very extensively of his time and his thought and energy for dental progress. He holds the highest office that the dental profession is able to give to any man. He holds the office of President of the National Dental Association, and I take great pleasure in introducing Thomas B. Hartzell, of Minneapolis.

THE NATIONAL DENTAL ASSOCIATION

By Thomas B. Hartzell, Minneapolis, Minnesota

I very well realize that I am outclassed at every point by the poet on my right. I have been learning many things in regard to California, and one of them I have just absorbed in the last few minutes, namely, that California has not based its whole excellence and reputation on climate. It appears from what Dr. Benbrook says that there are many other things that enter into it, and one of the most important of these is friendship. He says that Dr. Buckley has brought them a certain amount of benefit. I heard him say that every time John played golf with him he got three golf balls away from John. So you see California is not averse to taking benefits.

I have pulled in the harness with Dr. Buckley for many years as a member of the Board of Trustees, and I know every reaction that he has made on affairs pertaining to the National Dental Association has always been for its best interest. I never have known him in the years we have worked together shoulder to shoulder to react wrongly on any proposition pertaining to the life and success of the National Dental Association.

My toast is the "National Dental Association." As I have said, I have had the privilege of working with Dr. Buckley, and I have learned to love and know him much better than I would if I had not had that privilege, and as the theme the National Dental Association has not been treated by the poet on my right, I will speak of my toast.

Don Gallie wrote me a sweet little note in which he said, "Dr. Hartzell, I know that you have the reputation of making

great speeches, but you have no terminal facilities." And I am therefore standing here with my watch before me on the table, and I am going to take the opportunity to paint in a few words some of the ideals which I know both Dr. Buckley and I possess in regard to the National Dental Association.

The National Dental Association is the greatest dental organization in the world. It has more scientifically trained men in it than any other single organization of its kind in the world. It owes much of its progress in the last few years to the men in Chicago who have helped to bring this about. There is no one now living who can say that Dr. Buckley has ever failed in any emergency that arose, and he has been the inspiration of all of us. I can say with truth that with the work of various kinds in which we have been mutually interested, he has never failed to write me a letter.

I will be very glad if I can tell you in a brief way what we expect to do this year. The National Dental Association is trying this year to bring something to humanity. There is nothing in the world that appeals to me so much as that saying in regard to life, "No man hath greater love than he who lays down his life for a friend." We are not asking anyone to lay down his life for a friend, but to move on out of the ranks of mechanics into the ranks of the true healing art and increase its capacity to lengthen life. This is the first time we have had a topic that has less to do with our mechanical attainments and more to do with the application of the knowledge possessed by dentists to lengthen life. How sweet a thing is life, and how great has been the effort thru the years to lengthen life! It seems sad to us as we pass the meridian of life, that by the time we have acquired some ability to help our fellows we are placed on the shelf and must drop out of the scene of action when it would seem to us we are getting to be worth something. But it is unfortunately so. This idea of lengthening the span of life appeals to me particularly because I am going on to be a hundred right now. Every effort is being made to carry this thought thru every department of dentistry. The orthodontists, the exodontists, the prosthodontists, the operative dentists, the men who are engaged in oral hygiene are all stressing that thought, and that is the theme or goal toward which we are to work. I said to a group of men that if dentists would only study human nutrition, which is the fundamental source of all immunities; if they would, in addition to the technical knowledge which they possess in regard to the maintenance of the dental mechanism for mastication, study nutrition which should originate in the mouth, they would lengthen the span of life ten years. There is nothing from which the human race suffers so much, particularly in this country, as a failure to appropriate the energy in all the starches we consume, and not one iota of this starch digestion becomes of any value unless contacted with saliva. The mechanism for the beginning of this work lies with the careful dentist who should teach its value. If you look into the field of medicine, you will find the internists have neglected both the mechanical and chemistry of mouth digestion particularly, and here is one place where we can help to lengthen life and bring much happiness to people who suffer.

In every department of our association we have found co-operation, and the co-operation of the group in California thru Dr. Buckley has been inspiring, and the co-operation of the men along the north coast and the co-operation of the men in every state in the Union is splendid.

We have had a fairly successful year in the National Dental Association, in spite of great financial depression. It is true, we have received hundreds of letters from men in certain localities who could not even contribute a dollar for Christmas seals. Happily these conditions are changing. In the North we are starting our iron mines which have been idle for

two years. A single mine has paid $146,000.00 worth of taxes per year and did not market a dollar's worth of ore. This mine now employs three thousand men. The mines in Anaconda have placed some six thousand men back to work during the past week. Conditions are improving.

We hope you men of the great state of Illinois will come to the National Dental Association meeting because we want your help, and you should come for the added reason that you have friends and you have associations on the Pacific Coast that will draw you there.

The Toastmaster: I take great pleasure in introducing one of our most distinguished educators. He is a gentleman who has represented dentistry as a branch of the healing art in a most excellent manner in the University of California. He is respected and liked by all and loved on the Pacific Coast by all those who have come in touch with him. He is president of the organization known as the Institute of Dental Teachers. I take pleasure in calling upon Guy S. Millberry, of San Francisco.

Dr. John P. Buckley, the Dental Teacher

By Guy S. Millberry, San Francisco, California

From the time when the elder members of the clan gathered the neophytes in a circle about them and taught them the laws of warfare by demonstration, the problems of mathematics and the art of writing by symbols in the sand, and the principles of religion by ritualistic ceremony until now, when educaton holds a place second to none in human activity, insofar as national welfare is concerned, the teacher has occupied a very necessary, if not prominent place in our civilization.

In addressing one's self to this subject then, one may perhaps be permitted to touch upon the qualifications, interest, and duties of the teacher, as a preliminary to the toast.

Education presupposes the existence of the teacher, and teaching presupposes the qualifications, or a preparation for the task. The ability to teach demands a thoro knowledge of mind, matter, method, and the preparation for teaching involves native talent, study, memory, reflection, reason, and experience. Most of these are acquired thru our ordinary sense perceptions, tho their utilization is or should be regulated by that sixth sense, the common use, so dominant in the life of Dr. Buckley.

In addition to these qualifications, a warm heart, moral qualities, intelligence, and the inspiration to use it are valuable adjuncts. The personality and convictions of the teacher are paramount, for without these successful teaching is a questionable thing.

Three definite phases of the activity of the mind are, (1) conceiving ideas, (2) judging or associating these conceptions, and (3) reasoning or combining these judgments, the results of which, in an active normal mind, contribute to the development and betterment of society.

These qualifications and the usage of the mental activities essential in the development of a good teacher are embodied in the achievements of our honored guest; particularly do we find those which we choose to designate as convictions, personality, and moral qualities.

And what can be said of interest? Surely his interest in his life-work has been continuous and consistent. He has never been lost in vague contemplations or resigned to listless and indolent reveries. Beginning with his pharmaceutical training and experience and continuing thru dentistry, a dominant inclination has characterized his labors and attracted attention to his work. His lectures, his papers, his book are ample evidence of a teacher's interest in his life-work.

Teachers inherently and perhaps unconsciously follow the principles laid

down by educators who have gone before. Two of the cardinal principles of Pestalozzi's teachings, "to form the mind, not to furnish it," and "to popualrize science" stand out markedly as a part of the work of John P. Buckley.

It is the duty of a teacher to weld from all sources a body of mutually consistent and coherent principles, and to use them in guiding the classes that come to him for instruction. To have fulfilled this duty, not alone for today but for time in its continuity, modifying and adapting the accepted changes of the present to the established principles of the past, has been another manifestation of his work. Thus his teachings have been carried far beyond the scope of activities of the class room teacher to a broader, more comprehensive field for the benefit of humanity.

Many of you have learned your lessons directly from this teacher, others have learned indirectly thru faculty relationship. That his particular duties have been valued is evidenced by his return to his teaching activities after ill-health had endeavored to destroy his usefulness, and rest and recreation in the West had restored him to you; he has come back.

Were I to have chosen a title for this toast, I should have preferred "The Educationist" rather than "The Dental Teacher."

Education in the seventeenth century came to designate the art of training men. The constantly increasing part which natural knowledge has contributed to our character and education as contrasted with the older ideas of culture and education based on a knowledge of the dead languages is markedly evident in the scientific progress of this country. Our concept of the educationist as related to the teacher is that the former embraces a wider sphere of activity in his work than the latter.

The educationist must feel the cultural and moral relations of the world's currents of his time and of all time. He must know and rely upon the social institutions of which we are a part and for which we are responsible. He cannot confine his work to a narrow vocational ideal even tho it be a very definite and valuable one. His vision is "not of the eye—but of the intellect."

The empirical qualities determined by experience, contacts, temperament, and the intellectual qualities determined by capacity and attainment are more pronounced in the educationist than in the teacher.

Just as science is considered an ingredient in education, dentistry may be considered an ingredient in health; all of these may be included in the activities of Dr. Buckley.

Teachers in dentistry, to a large degree, shape the destiny of their profession, and since the dentist of today engages in civic, economic, political, social, as well as professional activities in his community, the inspiration and the reasoning power which come to him from those who educate him, not those who teach him the elements of a single subject only, are potent factors in his development, the results of an educationist's work.

John P. Buckley, dental teacher, collaborator in constructive dental education, educationist to the masses thru that larger group, the profession, benefactor of mankind, may your life's work be inscribed forever on the heraldic crest of your profession.

The Toastmaster: The next man I wish to call upon to respond to a toast is also one of our leading educators. He is dean of the College from which Dr. Buckley graduated and of which he has been a member of the faculty all these years. It is unnecessary to call your attention to the long list of achievements of this distinguished man. He has been president of the Chicago Dental Society, and of the Illinois Dental Society when it was celebrating its fiftieth anniversary, at which

time he demonstrated executive ability of which we all feel proud. Soon after that he was made president of the National Dental Association, and later he was called upon to serve his country in the Surgeon-General's Office.

I take a great deal of pleasure in calling upon Dr. Logan to respond to the toast "Dr. Buckley, the Man," because after all is said of a man's achievements, of a man's work, his life is the most important.

Dr. John P. Buckley, the Man

By W. H. G. Logan, Chicago, Illinois

As we all know Dr. Buckley is a real man, but since every man was once a child permit me to inform you that forty-eight years ago last December a very, very handsome baby boy was born in a modest cottage on a farm near that very little hamlet of Lowell, which is located in that very little state of Indiana. Indiana is a small state, yet she can with justification point with pride to the fact that many brilliant men and women have come from that commonwealth; yet the more eloquent and intellectual they are, the earlier they come from Indiana. The guest of the evening, being both eloquent and intellectual, came to us in his twenty-third year to study dentistry.

In the incredibly short time of eleven years after receiving his dental degree, he gave to the profession the first edition of his book on Dental Materia Medica and Therapeutics. It then stood and now stands as an authoritative work. Thus we see the guest of the evening arose from obscurity to a position of international authority in his chosen field in a decade after graduation.

Altho he had the advantage of the experience of teaching in the public schools for three years, followed by a course in pharmacy plus his instruction in dentistry as a foundation, I believe you will agree with me that we must go back into his youth and childhood if we would seek the source of his greatness and gentleness, the source of his integrity and lofty ideals. To my way of reasoning that part of his success that was not influenced by heredity may be in a measure explained by the fact that as a boy he had not only the hardships but the material opportunities and benefits that come to the youth reared in the country, for in the solitude of country farm life one often finds the source of intellectual wealth, of tranquil moods, of patience in the midst of great opposition, and full confidence in the fruitfulness of honest labor, be it mental or physical.

In the fifteen years that preceded the world-war, it was my pleasure and profit to often lunch with the guest of the evening, and during those periods I learned, without his knowledge, that as a little boy he laid the foundation and sowed the seeds of thought and habit that developed into the recognized leader we have met here to honor. As a mere lad he was want to sit by flowing water, to linger among blossoming trees, to dream in the silence that lies amid the hills, to feel the solemn loneliness of deep woods. There he learned to know every change that came over the heavens from the dewy freshness of early morning to the restful calm of midnight—all of which is an education above and beyond that which one may acquire within the walls of our cultural institutions. Hence the truthfulness of the oft-repeated saying that the chances are as a thousand to one that the genius will not be born in a palace in the city, but in a cottage on the farm.

But why search further for the influences that led to his fame, since we know it was based upon his early experiences, his faith in human nature, his industry and great love for men, women and little

children. Dr. Buckley has ever believed in the purpose and worth of the dental profession and has always been ready to serve her call which has been evidenced by his appearing before lay and professional audiences in nearly all of the important cities of this nation. He believes that dentistry has a bright future because he has observed the long, long strides it has taken forward in the last quarter of a century. He believes that the sincere general practitioner of dentistry needs no one to apologize for the merit and worth of his vocation.

Altho he admits a chain is no stronger than its weakest link, he knows the dental profession is not unlike the human body in fiber, sentiment and response to stimuli; therefore, if allowed to be cared for by its friends, its weakest parts will repair and mend until the whole has the strength of its best. And by the same token we expect to have Dr. Buckley back with us soon. Altho he was forced to go to California, we know the monotony of the monotonous climate of California will drive him back home—monotonous climate, yes, for all they have out there is the placid waters of the Pacific, the ever snow-capped mountains behind the city, the boundless blue skies, flowers that do nothing for three hundred and sixty-five days in the year but just blossom, days that are all sunshine, where the sky at night is always studded with stars and even the moon wears a perpetual grin—where the orange blossoms and the fruit dally from the same bough, where little children laugh and no one ever cries. In spite of all this stupendous monotony California is a great state, for it is known the world over as the land of the lemons and the home of the nuts.

Yes, Dr. Buckley, we want you back, the old place is not the same with you away. An individual with Dr. Buckley's spirit may be down but he is never out. We want you back because of the loftiness of your ideals and the soundness of your principles. We want you back, we want you back because of your impelling inspiration to assist in the solution of the problems of tomorrow.

We want you back, we want you back because you have not been soured by your critics nor made vain by your admirers, for you are today when at the top as humanly human as you were in your youth. We want you back here in your old home, and back in your old home we shall have you real soon.

The Toastmaster: The next toast is to be responded to by a man of science. Usually a man at the top is the man who has delved to the bottom of things. Our next speaker is a histologist and a biologist. He is a man who loves nature, who brings the beautiful flowers of California to his own backyard. One of the most characteristic things, one of the most beautiful expressions of the life of the man who is to respond to the next toast is his love of flowers, and the way they respond to his touch, Frederick B. Noyes, president of the Illinois State Dental Society.

The State Society

By Frederick B. Noyes, Chicago, Illinois

John, this banquet, as a token of admiration and esteem, has been given to you by the Chicago Dental Society, and as the Chicago Dental Society is the greatest component of the Illinois State Dental Society, this occasion has drawn to it your friends from every city and every portion of this state.

It has come to be a tradition that there should be in Chicago every winter a great dental meeting, which should be the inspiration of the scientific attainments and technical skill of the profession of the country, and the organization and the execution of such an undertaking has been cheerfully and willingly accepted and executed by this great component of the state society. I think we owe them a

great honor that they have so magnanimously accepted the burden of this performance as a function of the profession of the state.

We honor men for their service and we love them for their personality. The guest of the evening has served in every honored position, on every committee, in the executive council, in every position from the humblest to the highest executive position as president of the state society. He has contributed many valuable papers, both scientific and clinical. But beyond those services he has bound to himself the admiration and the love of most, if not all, of the individual members of that organization by his personal qualities, and so it is my simple duty and my great pleasure in behalf of the Illinois State Dental Society to express to you, Dr. Buckley, our honor, our esteem, our love. It is a message from me not only personally but as the mouthpiece of every individual of this, your home state society.

The Toastmaster: The next gentleman who is to respond to a toast is one of Dr. Buckley's students, who will tell of the kind acts, of courtesies extended, of thoughtfulness, of consideration, and of the inspiration that Dr. Buckley has been to them as a teacher and as a friend.

I take great pleasure in introducing to this audience and in calling upon one of our own members, John Elliott MacArthur, to respond to the toast "The Students' Friend."

The Students' Friend

By John Elliot MacArthur, Chicago, Illinois

"The Students' Friend" is the subject of my toast this evening. I would like to change that a little bit and call it "A Student's Friend" with reference to our honored guest, Dr. Buckley.

When I first came to Chicago, twenty-one years ago, a raw, green Scotchman from Canada, filled with a goodly amount of oatmeal and the shorter catechism Dr. Gallie saw me and singled me out by my French name because I came from the province of Quebec. He said to me, "MacArthur, there is one place you ought to visit, and that is Lincoln Park." "Well," I said, "I do not know why I should do that." He said, "You go out there, you are a country boy, and look the animals over." I could not see how there was anything inspiring about that. But anyhow, after starting for Lincoln Park two or three times and failing to get there—because it was a long way from the West Side—I eventually arrived. I shall never forget the reception I received when I went into the animal house and approached old King Leo. He let out the mightiest roar that you ever heard. I didn't know whether he was glad to see me or not. It was the first time I had ever really heard a lion roar.

Our class was divided into quiz sections. There was always some deviltry going on before the quiz master got there, and on this particular occasion this lion's roar was still sounding in my ears. I was pretty close to the quiz master's chair, and I traveled up and down the floor and roared like old King Leo in Lincoln Park. The boys thought it was wonderful. I did it two or three times and the incident was forgotten for several days.

Then one day we were assembled in the large amphitheater to appear before Dr. Buckley. Some one said, "Mac, stir up the lions." My back was turned toward the pit. I gave forth two or three roars like King Leo. I repeated this performance four or five times. I saw the boys snickering and acting as tho they were sorry for me. I looked down into the pit, and realized that Dr. John P. Buckley had walked in during the per-

formance. He wore a golden mustache in those days. I do not think Mephistopheles or any Bolshevist ever smiled a more diabolical smile than he did. I was frozen to the spot. I did not know what to think. I could not act; I could not say anything. Finally a student grabbed me by the coat and pulled me into my seat. Dr. Buckley never said a word. He went on with the lecture. I went home that night much alarmed. I had visions of being called before the faculty to explain the incident, of being dismissed, and my whole career being shattered. But I felt glad afterward that Dr. Gallie had told me to go to Lincoln Park to look at the animals, because it took the courage of a lion to speak to Dr. Buckley about it. Two or three days later we met in the chemical laboratory. Dr. Buckley was most courteous to me. Nothing was said but I was trying to muster up courage to speak to him about the incident. Finally I said: "Doctor, I do not know how to begin to apologize to you for my actions the other afternoon. In fact, I cannot apologize. The truth of the matter is I didn't see you." "Well," he said, "I am glad you have come to me and spoken about this matter. I thought you might have something against me and was trying to get even with me in front of the whole class. I could not imagine that anybody would want to take it out on me the way you did. However, you have explained the matter to me, and I am glad you came and shook hands with me." And the incident was forgotten as far as he was concerned, but nevertheless I shall never forget it. Dr. Buckley's understanding of the happening gave me welcome relief. So much for the story and all its pleasant memories.

I cannot confine myself strictly to this toast, because this old war-cry has stirred up the lions in connection with Dr. Buckley, and it seems to come back to me and to suggest to me the real theme of my response to this toast tonight.

This meeting is an inspiration to all of you gentlemen. These meetings are wonderful things for us, and the lion I would like to stir up tonight, the real lion I would like you to understand and appreciate I am going to label *service.* There never was a time in the history of our profession when real honest service was more in demand of us as intelligent gentlemen than now. I mean service from the point of service. We come here to these meetings; we understand all these splendid ideas that are brought to us, and some of us are carried away by them. We do not keep our feet exactly on the ground. We get into controversy; we get into arguments as to whether any certain department of dentistry is more important than any other. We do not seem to understand that the real mission in life which we have is service. We must let that thing be uppermost in our minds, not elegant offices, not so much per hour for our time, not our wonderful equipment, not our aristocratic standing in the profession. That does not mean service. But real service, the love of doing a thing for the very thing it is. Humanity is waiting for that kind of service, and that's the kind of service I want to stir up in your hearts tonight. I want you to feel that success is not measured by dollars; that success is not measured by the possible aristocratic standing which you enjoy in your profession, but it is measured by the fulness and understanding of the heart of humanity, and humanity is waiting for you and for me to carry this message on.

I was reading an article on friendship by Thoreau recently and I do not know of any way that I could better express our feelings than to quote the sentiments of Thoreau on friendship, and I am sure they will appeal to the various student bodies that have passed under your care and to the profession at large: "I love thee not as something private and personal, which is your own, but as something universal and worthy of love which

I have found. Oh how I think of you? You are purely good—you are infinitely good. I can trust you forever. I did not think that humanity was so rich. Give me an opportunity to live. You are the fact in a fiction; you are the truth more strange and admirable than fiction. Consent only to be what you are. I alone will never stand in your way. This is what I would like, to be as intimate with you as our spirits are intimate, respecting you as I respect my ideal. Never to profane one another by word or action, even by a thought. * * * I have discovered you; how can you be concealed from me?"

The Toastmaster: Dr. Buckley, guest of honor, of Chicago, of Los Angeles, president-elect of the National Dental Association, teacher, member of various dental societies, author and friend; we now give you an opportunity to say a few words.

DR. JOHN P. BUCKLEY, LOS ANGELES, CALIFORNIA

I am inclined to refer briefly to the truthful incident which has been related by the last speaker. Altho it has been twenty-one years ago, I have seen this particular student perhaps the least of any of the boys that have located in Chicago. For some reason unknown to me, I remember the incident as tho it occurred yesterday, and when he came to me in the chemical laboratory and apologized as he did, I saw behind and beneath that big, boyish countenance a heart which I knew would make a man, and while I have waited twenty years or more to hear the speech that he has delivered tonight, I assure you it has been worth while.

In justice to the office of this Association, and I feel in justice to myself, there is one fact associated with this banquet tonight which has not been explained and which I feel should be explained. Mention has been made of the fact that I received the honor at Milwaukee of being made president-elect of the greatest dental association in the world. But it is only fair that you should know that some weeks before I left California for Milwaukee, I received a letter from the Secretary of this Society (Dr. Printz), in which he informed me that I had been selected as the one to be honored at the mid-winter banquet in January, and wanted to know if it would be convenient for me to come. I never received a letter in my life that gave me the peculiar, indescribable feeling that that letter gave, because I thought of the men who had been thus honored: the late G. V. Black was the first; Truman W. Brophy was the second; Thomas L. Gilmer, I think, was the third, and then came Edmund Noyes, and Calvin S. Case. I know and you know that dear as Illinois is to me, I would never justly be placed in the group in which those men rightfully are classed, and then I began to realize that this letter must have come to me, a comparatively young man, not so much for what I may have done for dentistry, but more because I had the misfortune in the very middle of my career to have left my associates here in Chicago and go to that obnoxious climate of California, mentioned by my good friend, Dr. Logan. I repeat I never received a letter that gave me the peculiar feeling that that letter did, and it is only fair to you to know that whether I had been successful or not at Milwaukee, this banquet would have been held just the same, not because I received that honor, which I appreciate, but because of that which I was and tried to be while I was here working with you men. I do not know how you men feel, but to me there is no honor equal to that which one can receive from friends in your old home, and I appreciate this honor far more than words can express.

I see men in this audience from most of the states in the Union, but I am not going to believe that which I know is not true, that they all are here to honor me.

They are here largely to attend this great meeting of the Chicago Dental Society Some of them are here because of the forthcoming meeting of the National Dental Association, and others are here because they are on their way to attend the meeting in Montreal of the Institute of Dental Teachers. So while I am glad you are here, and while I have a right to believe you are my friends, I know you are not here solely for the purpose of honoring me. But, my dear friends, there are in this audience social friends of Mrs. Buckley and myself, friends whom we met in the old Ashland Club twenty or twenty-five years ago, and more recently in the Colonial Club of Oak Park where we lived, and I want those friends to know that both Mrs. Buckley and myself appreciate their presence here. We have been in their homes and they have been in ours, and I think the highest test of friendship is to be able to feel at ease and comfortable, to feel at home if you please in the homes of your friends, and I know that these friends of ours seem to feel at home in our modest home. Whether or not that is true, I do know that Mrs. Buckley and myself feel perfectly at home in the homes of these social friends, and I could add to that, in the homes of many of my professional friends who are in this audience.

Henry Drummond some years ago propounded the question, "What is the greatest thing in life?" And then by argument and implication he proceeded to answer it, and his answer was *love*. He said "to love is to live, and you had better not live than not to have loved." It was Tennyson who said, when his dear friend Arthur Hallam died: "It is better to have loved and lost than never to have loved at all." And so Drummond wanted to live and, he said: "If you ask me how long I would like to live, I would say I want to live forever for the same reason that I want to live tomorrow. I want to live tomorrow because tomorrow there is some one I want to see, some one with whom I want to be, some one who loves me and whose love I reciprocate." And so, like Henry Drummond, I, too, want to live forever because there is some one tomorrow I want to see, with whom I want to be, and whose love I want reciprocated.

Whether or not the climate of California, the mountains, the sea, the flowers and the orange blossoms are obnoxious to some of my friends, they are not obnoxious to me. At that banquet, which was tendered me recently in Los Angeles, I said I was going to stay in California because it had meant much to me, because out there I was perfectly happy and contented, and then I attempted to explain that which I will not attempt to do tonight—why I was happy and in my way contented. But I did say one thing I will repeat tonight, I am happy to be out in California and away from Chicago, strange as it may seem to you, if I may be pardoned again, because not in the four years that I have been there, but in a few months I have learned to know a little woman better than I knew her in the twenty years that I lived with her here. You gentlemen need not be surprised at that statement, because I know some of you men well enough to know that you do not know your wives any better than I knew mine when I lived here. If the break in my life, the change of my life's plans, the ambitions and aspirations I had will help some of my friends in their onward rush and in their unconscious neglect of their homes to reflect and give more time to their wives and children, the change that I may have been forced to make will not have been made in vain. I hope some of you men will profit by the experience which came to me.

Dr. Hartzell has given the National Dental Association the slogan that dentistry can add ten years to life, and on different occasions he has endeavored to prove the truthfulness of his slogan. It

is true that our science of dentistry has already increased or lengthened the span of human life. It is true, that the joys of life have been multiplied by those who will indulge moderately. It is true, that the productive capacity of the individual has been increased far beyond that which it ever was in the past. But did any of you ever stop to realize and consider that with all our progress and ingenuity, with all our skill and invention, that no substitute to do the work of the world has ever been discovered. Our work may have been made more easy. We accomplish things in different ways, but still, you and I must produce our full capacity if the world's work is to be done. I never will be perfectly contented, altho I am forced to be satisfied, until I can again get back into the harness with both feet and do my share of the work that is to be done in our profession.

The last time I was here, the afternoon I was to leave I was in Dr. King's office to see if he had any message to give the boys back in Los Angeles for the coming meeting of the National Dental Association, and as I sat there Dr. Dean, the President of the California State Dental Society (the northern part of the state) came in, and when we left Dr. King I had only about half an hour to spare, for Dr. Elliot was waiting for me in my old office. I asked Dr. Dean if he would like to see Dr. Goslee. He said he certainly would. And then I said to Dr. Dean, "Would you like to see Dr. Case; you are interested in orthodontia." He said "yes". We went to see Dr. Case as we saw Dr. Goslee and we had to beg each of their pardons because we were in a hurry. I said I must see Dr. Coolidge because I knew of this event, and I did not want to go away without seeing him, and I asked Dr. Dean if he would like to meet him. He said he would. We hurriedly went to see Dr. Coolidge, stopping at Dr. Lourie's office, another orthodontist. Dr. Lourie was out. I nearly forgot C. N. Johnson, who had been out of town, and I said I had not seen him since the Milwaukee meeting, and I would not dare leave Chicago without seeing him. The day before I had been to see Dr. Fred Noyes and his father. They were both out. I had seen Dr. Gilmer, Dr. Black and Dr. Gethro. I had also seen Dr. Roach, Dr. Dittmar and Dr. Gallee, but when we left C. N.'s office I said, "I must see Logan and Grisamore before leaving Chicago. Don't you want to go?" Dr. Dean said he did. And up we went. As Elliot was waiting for me in the old office, we went to these offices and simply said, "How do you do," and "Good bye." During all these visits I noticed a pleasing expression on Dr. Dean's face, and as we were about to take leave of each other he said, "Say, did you notice the smile on the faces of these men as you went in?" I replied, "They always smile when I go in." "But that was not an ordinary smile. Didn't you notice the *way* they smiled?" I replied, "No, I did not notice it." Then I said, "Almost every one of them called me John, but our distinguished toastmaster and some day he will call me John." Dr. Dean said, "Yes, they all called you John." "That is all right, we always call each other by the first names. I would never think of calling Dr. Brophy, Dr. Gilmer, or Dr. Edmund Noyes by their first names. But the rest of you I will call by the first name, even the distinguished Cal Case. We have always done that." Then Dr. Dean unconsciously said something which hurt: "Knowing these great men as you do and having had the privilege of living with them here as you have, I do not see how you can stay out in California, that obnoxious country of California." While my California friend did not mean to hurt me by saying this nevertheless it did hurt, for if I were inclined to admit the truth, which I have seldom admitted since I left here, it did hurt to have to stay away, especially in the early days before I became acquainted

with the men out there and before they took me in. You men here cannot appreciate what those men have done for me, and I am not going to try to explain it because I can hardly understand how these men on the Pacific Coast, both in Los Angeles and San Francisco, especially Los Angeles, the city in which I live, took me into their midst. It is only fair to say that not one of these men out there will replace in my heart the love I have for you men here in Chicago, and I hope that my heart is big enough to take in all my friends, and I have learned to know that I have friends in other cities besides Los Angeles and Chicago. I want you men here in Chicago to know that when I say I am happy and contented out there, it does not mean I have forgotten the friends that I have here in Chicago and Illinois.

Dr. Coolidge, I know, sir, that back of and behind this whole proposition, tho you may not admit it, and tho you are perfectly willing to share the honors with your fellow-officers, you are responsible as one of my students for suggesting my name, and I hope that I will live long enough to deserve this great honor. I do not deserve it now, but I hope that I will live long enough to deserve the honor that has been tendered me by the Chicago Dental Society over which my friend, Dr. Coolidge, has had the privilege of presiding. I cannot thank Dr. Coolidge and his fellow-officers in the way in which they should be thanked for a recongition of this kind, but I hope you will understand that I do appreciate it.

There comes a time in a man's life when he cannot trust himself to think, when all he wants to do is to feel, and that is the position in which I find myself tonight. I certainly feel all that I am not able to say. I thank you for this great honor from the deepest recesses of my heart.

[Fred W. Gethro, on behalf of the members of the Chicago Dental Society, presented Dr. Buckley with an album in which were inscribed the names of all persons attending the banquet. The title-page was embossed in a very artistic manner, bearing the following inscription: "Presented to Dr. John P. Buckley at a banquet given in his honor by the Chicago Dental Society, Thursday, January 19, 1922, at The Drake."]

Reminiscences of Forty-five Years in Dentistry

By C. N. JOHNSON, M.A., L.D.S., D.D.S., M.D.S., F.A.C.D., Chicago, Illinois

VII

I HAVE always maintained a great deal of respect for those in authority over me, and so when my teachers in college made a statement I was inclined to accept it at its face value, without much reservation. And yet I had not been long in practice before I learned that no man is infallible and no statement invariable. I had been taught that if a third molar became abscessed, it should at once be extracted, and that no effort should be made to preserve it. I think that this would be considered good teaching today, and yet in the very early months of my practice I encountered a case that presented a problem which I could not settle in that summary manner. A lady whose patronage I esteemed very highly came to me with an upper third molar having a sinus opening of long standing. She had applied to other dentists only to be told that nothing could be done in the way of treatment, and that the tooth must come out. She had lost so many teeth that this seemed a calamity to her and she came to me with such an appeal that I finally consented to remove the filling that had been in it for some time and see what could be done. The sinus yielded promptly to treatment, I subsequently filled the canals and cavity, and I had the pleasure of seeing the case at intervals for a quarter of a century, and there had never been a recurrence up to the time of the patient's death. (I may say parenthetically that the patient died at a very advanced age, lest some of our fanatical friends may claim that her death was caused by having a pulpless tooth in her mouth.)

The saving of this tooth for that dear lady resulted in such loyalty on her part that long after I had left Collingwood she came to Chicago to have me attend to her teeth. In that case if I had followed authority literally I should never have done the service for that patient to which she was justly entitled. And let me say in this connection that this is by no means an isolated case where I have known pulpless teeth to remain in comfortable and serviceable condition for very many years; in fact our records will show such a large percentage of these cases that they disprove without cavil the statement so freely made in recent years that pulpless teeth are necessarily a menace to the patient's health.

It may be of interest to know the material with which we filled canals in those days. As I stated at the beginning of these articles it was not the custom in the country districts to try to save many pulpless teeth at the time I began to study, and yet I soon learned that the operation was possible, and after I came out of college I at once began to practice

it. I cannot vouch for the profession at large as to the material but my custom was to mix oxychlorid of zinc into a rather thin paste and incorporate it in a few fibers of cotton. This was carried as perfectly as possible to the end of the canal—care being taken not to force any of it thru, on account of the irritating properties of the oxychlorid of zinc. The cotton served as a medium for carrying the cement to place, but I am sure there must have been very many cases where we failed utterly to reach the apex. Yet in spite of this limitation I can affirm that most of those cases gave no subsequent trouble, and I am convinced that there is real virtue in the oxychlorid of zinc as a root filling if we could only work it into small canals. Today in the management of pulpless cases I never fail to fill the pulp chamber with this material after the canals have been filled with gutta-percha. It has a virtue as a protection against the ingress of micro-organisms which I am sure the profession does not fully appreciate.

Moving to Chicago

I had been practicing in Collingwood for a little more than three years, when in the most unaccountable manner I concluded to move to Chicago. I say unaccountable because I am not yet quite able to analyze the mental processes which impelled me to give up what was really a very attractive practice where I was well known and launch out into the mazes of a large city where I was not known at all. I had married and assumed the responsibility of maintaining a household, which should have constituted one more argument against making a change. I had equipped my office with all of the requisites of those days. I had furnished a home in such a manner that it set the tongues of all the dear delightful gossips of the neighborhood wagging about my extravagance. I had a bank account which was considered plethoric for a professional man, and I owed not a penny to anyone. What more could a man want? At least this was the argument of my friends when the word got out that I thought of making a change. I have never made any move in life with the opposition to confront me that I received in this instance. Even the members of my family were skeptical. All united in the contention that it was a foolish experiment to give up a certainty for an uncertainty. One dear dental friend of blessed memory—who of course practiced some distance from Collingwood—metaphorically backed me up in a corner and labored with me long and earnestly on the folly af the venture I was about to make. He was desperately concerned at the prospect of the colossal mistake, and clinched the argument by saying: "You are a married man, and presumably may raise a family. Chicago is such a terribly wicked city that you have no right to bring up children in a place like that. Then besides," he added, as the final thrust, "I hear that most of the people there have catarrh, and are therefore very disagreeable to work for." Can anyone imagine the perversity of a man who could fly in the face of providence, and deliberately go to Chicago after an avalanche of arguments such as these? But that is precisely what I did.

There was only one man among all my acquaintances who said an encouraging word about the venture I was to make. He was one of the leading lawyers of the town, and he was gracious enough to write me a note begging me to pay no attention to the discouraging remarks that were being made by my friends. Said he: "While I am sorry to lose your services for my family, I must not be selfish enough to regret seeing you go to a larger field where your ability will enjoy a wider expansion." I could have

risen up and blessed that man, and in fact I did. In addition to thanking him at the time, I have done so in my mind many times since.

It required no small amount of courage to go counter to the judgment of so many of my friends, and I never could have done so had it not been for an overpowering impulse which had seized me that this was the thing for me to do. I have said that I could not analyze my mental processes on this occasion, but the nearest explanation I can make is this: I was a great reader of dental periodical literature. I subscribed for dental journals, and *read them.* I saw frequently the names of leading men in the profession as they appeared in the proceedings of dental societies, and I grew familiar with them. The more I read, the more I wanted to know these men personally, the more I wanted to sit at their feet and learn of them, the more I hungered for the inspiration which I felt sure they could give me. I had practiced long enough to know something of my limitations, and I wanted to overcome them. I felt that to associate with men who knew so much more than I did would add a new interest to my professional life, and this conviction grew and grew each day till I could no longer be content with life unless I at least made the trial. When this decision was arrived at no influence on earth could have diverted me and I at once made my plans to leave Collingwood. I do not admit that I left without many a pang. The people had been so infinitely kind to me, they had given me my first start in life, and had become so endeared to me in many ways, that it brought a lump to my throat as I swung aboard the train that carried me out of the town. And the lump has reappeared many times since as I have recalled the dear old place.

But a new world was to open to me, and in all the thirty-eight years since then I have never for one moment regretted the day I came to Chicago to live. It was to bring to me a new revelation, a wider professional horizon and a larger vision of life as a whole. Sooner than I expected I was brought into close contact with men whose names had been a household word to me thru the dental journals. The first dentist I met in Chicago was the man who was to become my closest personal friend thru a long period of professional activity, Dr. Truman W. Brophy. I had planned to take a course and graduate in the Chicago College of Dental Surgery, and Dr. Brophy was the dean. I had had some correspondence with him relative to the college, and when I stepped into his office his reception was so very cordial that I felt as if I had known him always. Then I was soon to meet that immortal group of men, Cushing, Harlan, Swain, Allport, Koch, Crouse, Noyes, Swasey, Haskell, Newkirk, Gilmer, Talbot, and most cherished privilege of all, I was to know with an ever-increasing intimacy that great beacon light of the profession who stood out conspicuously as the foremost scientific dentist of his time, the revered G. V. Black. Can anyone marvel that I found my new environment at once attractive, instructive, and stimulating? The way those men took me into their companionship continues to be a matter of wonderment to me yet, and at the same time it calls forth my profoundest gratitude. Never was a young man so fortunate as I, and my sole regret is that I have not been able to make more effective use of the privileges that were meted out to me by that splendid group of men who were in the vanguard of dental progress when I first came to Chicago. During all the years of my practice here it has been my cherished privilege to know quite intimately most of the men who have given shape and direction to professional growth in that period and the chief in-

centive to the writing of the present series is to reminisce about these men, and give glimpses, as best I may, of my personal experiences with them—particularly in so far as they bear on their leading characteristics, and reveal their individual trend of thought. Manifestly I can touch on only a few of them compared with the many that are in my mind, and my chief embarrassment lies in the wealth of incident at my command and the necessity of excluding so much of it from these pages. Neither can I promise to treat of these men in anything like a systematic or orderly arrangement. I must run at random wherever fancy leads me, knowing full well that I shall leave out much that should be said, and shall say inadequately that which I attempt to present.

One of the outstanding figures of the profession when I came to Chicago was the late Dr. W. W. Allport. He was not connected with the college but I soon met him, and became impressed with his distinguished personality. He was known as a brilliant operator, and enjoyed a select practice. He was a man of strong likes and dislikes, and woe betide the individual who came under his displeasure. He was striking in appearance, and was always a commanding figure in any dental gathering. After graduation I joined the Chicago Dental Society and attended each meeting. I drank in every word those great men uttered and was finally induced to take part in the discussions myself. I shall never forget an experience I had with Dr. Allport at one of these meetnigs. We disagreed on some minor points of practice, and as I had not learned then (in fact have never learned since) to exercise diplomacy of speech when I have a conviction to present, I contended for my point without the slightest hesitation, and with the proverbial temerity of youth. Some of my friends came to me after the meeting and said: "Johnson, you have put your foot in it this time." I asked "Why?" "Because you have attacked one of Allport's pet theories and he will never let up on you till he has taken every inch of your hide." "All right," said I, "I will grow another, and I will repeat what I said tonight, because I believe it." But I did not feel quite so serene as my attitude indicated. Dr. Allport was known as a resourceful debater, and there were very few who cared to cross swords with him. But my fears proved groundless. A day or two later we met on the street, and he made straight for me, holding out his hand. "Johnson," he said abruptly, "I admire you for what you did the other night. If every man would come out and attack me to my face like that I wouldn't complain, but it is those whelps who backbite me that I cannot tolerate. By the way, what kind of gold was it that you spoke of? I want to try some of it." And from that time we were the best of friends.

I have today in my possession a small piece of gold the history of which is as follows: One day a lady applied to Frank H. Gardiner to have a loose bicuspid extracted, and when it was out she remarked that the tooth contained the first filling Dr. Allport inserted when he began practice in Chicago, thirty-five years before. When Dr. Gardiner met Dr. Allport he asked him if he remembered the first filling he made when he came to Chicago. Dr. Allport answered that he did and mentioned the name of the patient, and told which tooth it was. "Here is the tooth," said Dr. Gardiner, handing him the bicuspid. Dr. Allport had the tooth broken, the gold filling removed, and rolled out into a piece of plate to show to his friends. It is that gold which I have today, and I prize it very highly for two reasons—the respect I have for a bit of gold that would save a tooth for that dear woman thirty-five years, and also as a memento of Dr. All-

port's skill as an operator. I cannot resist the temptation to say in passing that Dr. Allport informed me that the equipment he had in his office when that filling was inserted was an ordinary rocking chair for the patient to sit in, and that his operating cabinet consisted of a plain pine table covered with a copy of the *Chicago Tribune.* "Great oaks from little acorns grow." Later of course Dr. Allport had a fine equipment for his office. He died in 1893, and about a year before his death he had bought a new operating chair. At his death I was favored by the privilege of purchasing this chair and I have operated with it ever since. I confidently expect it to outlast the operator.

When Dr. Allport's biography was to be written for the *American Journal of History,* he selected me to write it. I really felt this a great honor, and put some effort into its preparation. When the manuscript was ready I sent for him to let me read it to him to verify the dates and facts before sending it to the editor. In the concluding paragraphs of the article I had summed up his characteristics as best I could, and as I finished reading I was dismayed to find him sitting there in my office sobbing like a child. He was for some reason greatly shaken, and struggling, with little avail, to control himself, he took me by the hand and walked out of the office without a word. The next day I received a letter from him apologizing for his "weakness," and saying that he was so unaccustomed to have kindly things said of him that when he listened to the commendatory remarks I had written he was completely unnerved.

How little we know of the hidden springs in every man's nature! Here was a man with the reputation of being firm as adamant, and yet when touched in the right spot he was as tender as a babe. Why do we not in our dealings with men always try to touch them in their tender spots, and thus bring out the wondrous wealth of affection that too often lies hidden under a brusque exterior? Why do we not foster the better impulses of men, instead of forever creating contention by opposing them, and rubbing their sensibilities the wrong way? I do not know why, unless it is because we have not yet solved the problem of what is wisest and best in our intercourse with our fellowman.

(*To be continued*)

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Editorial Department

RADICALISM GONE MAD

During recent years, in common with the general demoralization consequent on the war, certain practices have sprung up in our profession which have tended to work serious injury to our patients, and to bring discredit on our calling. For instance it has become axiomatic that altogether too many teeth have been extracted thru a distorted point of view as to the significance of focal infection, and the relation of the teeth thereto. While the profession needed a stirring up on

the role which the teeth may play in disease, yet the extreme to which the extraction of teeth has been carried is not creditable to dentistry.

Following the lead of some of the medical profession, a large element among dentists have been stampeded out of their judgment and their usual methods of practice, and have been influenced to extract many teeth which should have been preserved. It is hoped that a saner attitude on this question is approaching.

In line with the craze for extracting teeth have sprung up other practices which have left a trail of disaster in their wake. The so-called "surgical removal of teeth" has been carried beyond the bounds of reason, and has done much needless harm. There has been too much cutting and slashing in the human mouth—too much spectacular operating. To curette all areas from which teeth have been extracted—even diseased teeth—is a radical procedure which is not justified. The cases where curettement is indicated are very rare, and they should be selected with discriminating judgment.

In this connection it would be well for those who are following these extremes to read most carefully the paper by Thomas L. Gilmer in this issue. Dr. Gilmer is a man of long experience and careful observation, and what he says is entitled to respect. Speaking of curettement he says: "When the tooth, the cause of the infection, is removed, this granulation tissue usually becomes mature tissue, completing the repair."

And further he says: "Those who have made unprejudiced examination of large numbers of radiographs of edentulous jaws, where the teeth have been removed by the usual method and with no surgical interference whatever, must have come to the conclusion that it is very rare that infection persists after extraction. When rarefied regions have persisted they are generally due to parts of encapsulated abscesses, to small cysts, or to non-infected connective tissue which has had no lime salts deposited in it."

Then he speaks of the dangers of surgical removal and curettement, and remarks: "Numerous instances have come under my observation where serious results have followed the surgical removal of teeth."

These are sterling words of wisdom and warning from a man who is never careless of speech, and they are commended to the consideration of every dentist and physician. When we stop to recall the myriads of teeth which have been extracted in the usual way, and following which the tissues have promptly healed and become normal, with no subsequent complication, it compels the conviction that in the

recent past there has been altogether too much conjecture, and too much radical interference with nature.

Sitting down and soberly thinking over the present situation it is not far-fetched or unjust to charge the profession with a mental aberration on this subject which would be ludicrous if it were not so serious. It is always serious to pursue a practice which works irreparable injury to patients, and this is being done every day in the name of so-called "modern methods." It is radicalism gone mad. The havoc that has already been wrought in human mouths can never be computed and the time must come when it shall cease if we are to preserve the reputation of our profession, and stand unsullied with an open countenance before the eyes of thinking men.

THE NEW METHODS OF THE NATIONAL BOARD OF MEDICAL EXAMINERS

A few months ago the National Board of Medical Examiners adopted a new and what has proved to be an unusually successful plan for conducting its examinations. Formerly each examination was held in one isolated city, so that applicants were required to spend time and money in railway travel that few could afford. The only variation was in the occasional selection of a different city for the examination. Under the new plan, the examination is divided into three parts: Part I to be taken by students at the end of the sophomore year; Part II at the end of the fourth year, and Part III, a practical examination, on completion of the student's hospital interne year. Of great importance, however, is the fact that Parts I and II of the examination may be taken by the student in any Class A medical school, and even Part III may be taken in any one of fifteen large cities in different parts of the country in which the examinations are held simultaneously—a plan similar to that repeatedly suggested by the *Journal*. Under the new plan, also, instead of a nominal fee of $5.00 the examination fee has been increased to $100.00, $25.00 each for Parts I and II, and $50.00 for Part III. The results of the first examination under the new plan have just been received. Instead of from ten to sixty—the latter the highest number heretofore—108 students appeared at this examination, eighty-seven in Part I and twenty-one in Part II; and this in spite of the higher fees. The results of the new plan, therefore, are most encouraging. The more convenient arrangement for the examination, the larger numbers taking it, and the larger income obtained constitute a greater guaranty of the permanence of this board. Instead of being

dependent on the charity of a great foundation, it will hereafter be on a self-supporting basis. The recognition of the certificate granted by this board is being widely extended. It is now recognized by the Army and Navy for admission to the medical corps of those services; it is accepted by twenty-one state licensing boards in lieu of their own written examinations, and it is accepted by the Triple Qualification Board of Scotland and the Conjoint Board of London for admission to their final examinations.—*Jour. Amer. Med. Assoc.*, April, 1922.

PROPOSED HIGH TARIFF ON SCIENTIFIC INSTRUMENTS

The Fordney Tariff Bill places an increased tariff on microscopic, optical and other scientific instruments and, according to newspaper reports, the Senate, on motion of its Finance Committee, has refused requests by educational institutions that they be permitted to obtain scientific instruments and apparatus free of duty. In this regard the proposed legislation is a complete reversal of the government's attitude toward educational institutions. The available funds for scientific instruments in such institutions are invariably inadequate in comparison with the great needs and possibilities of education and scientific research, which should not be hindered by undue taxation. Exemption of education from taxation has been the policy of previous bills and it has proved satisfactory. It is to be hoped that the Senate may see its way clear to reconsider this particular point; failing that, that the situation may be corrected when the tariff bill comes to conference. To eliminate the exemption of educational institutions would be a serious blow to the cause of science and of scientific medicine in particular.—*Jour. Amer. Med. Assoc.*, June, 1922.

"There is no doubt but that the *Journal of the National Dental Association* is the best dental magazine in existence and I wish to say again what I have said many times before and that is that we have our editor to thank *very largely* for the *Journal* as we have it now."

(*Signed*) TOM SMITH,
Langdon, N. D.

Announcements

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

National Dental Association, July 17-21, 1922, Ambassador Hotel, Los Angeles, Cal. Otto U. King, Secretary, 5 N. Wabash Ave., Chicago, Ill.

National Society of Denture Prosthetists, July 3-15, Dental Department, University of Southern California, Los Angeles, Cal. E. B. Owen, Secretary, 335 Frisco Bldg., St. Louis, Mo.

National Association of Dental Examiners, July 17 and 18, Ambassador Hotel, Los Angeles, Cal. H. C. McKittrick, Secretary, 1006 I. O. O. F. Bldg., Indianapolis, Ind.

National Association of Dental Faculties, July 13, 14, 15, Hotel Clark, Los Angeles, Cal. Herbert L. Wheeler, Secretary, 560 Fifth Ave., New York, N. Y.

National Dental Sorority, July 17, Ambassador Hotel, Los Angeles, Cal. Mae Fontaine, Secretary, Consolidated Realty Bldg., Los Angles, Cal.

American Dental Library and Museum Association, July 17, Ambassador Hotel, Los Angeles, Cal. B. W. Weinberger, Secretary, 42 E. 41st St., New York, N. Y.

American Society of Oral Surgeons and Exodontists, July 11-14, Hotel Alexandria, Los Angeles, Cal. Joseph P. Wahl, Secretary, 1135 Maison-Blanche Bldg., New Orleans, La.

American Society of Dental Radiographers, July 19 and 20, Ambassador Hotel, Los Angeles, Cal. Martin Dewey, Secretary, 501 Fifth Ave., New York, N. Y.

Association of Military Dental Surgeons, July 18, Hotel Ambassador, Los Angeles, Cal. Rea Proctor McGee, President, 613 Jenkins Bldg., Pittsburgh, Pa.

American Academy of Periodontology, July 10, 11, 1922, Drake Hotel, Chicago, Ill. J. Herbert Wood, Secretary, Cleveland, Ohio.

American Dental Society of Europe, July 28-31, London, England. William A. Spring, President, 8 W. 40th St., New York, N. Y. F. W. Fleming, Secretary, 13 Queen Anne St., London.

American Public Health Association, October 16-19, Cleveland, Ohio.

Interstate Activities (meeting of delegates) July 19, Hotel Ambassador, Los Angeles, Cal. John E. Gurley, Chairman, 350 Post St., San Francisco, Cal.

Pacific Coast Society of Orthodontists, July 13, 14, 15, Hotel Angelus, Los Angeles, Cal. Carl O. Engstrum, Secretary, 306 Hagelstein Bldg., Sacramento, Cal.

Delta Sigma Delta Alumni and Grand Chapter Fraternity, July 17, Hotel Alexandria, Los Angeles, Cal. R. Hamel D. Swing, Supreme Scribe, 1623 Walnut St., Philadelphia, Pa.

Psi Omega Alumni Fraternity, July 17, Hotel Clark, Los Angeles, Cal. Max Wassman, Jr., Grand Master, 409 Elkan Gunst Bldg., San Francisco, Cal.

Xi Psi Phi Alumni Fraternity, July 17, Hotel Hayward, Los Angeles, Cal. J. Emmett Northcutt, Secretary, St. John and Elmwood Ave., Kansas City, Mo.

STATE SOCIETIES

July

Montana, at Helena, (6, 7, 8).
Utah, at Los Angeles, Cal. (19).

August

Washington, at Seattle (2-5).

September

Delaware, at Wilmington (14).

October

Northern Indiana, at Wabash (2, 3).
Virginia, at Richmond (18-21).

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

Delaware, at Municipal Building, Tenth and King Streets, Wilmington, July 12 and 13. Secretary, W. S. P. Combs, P. O. Box 221, Middletown.

Idaho, at Boise Bureau of License, January 10 and July 11, 1922. Paul Davis, Director, Bureaus of License, Boise.

Maine, at State House, Augusta, July 6, 7, and 8. Secretary, Henry Gilman, Portland.

Montana, at Helena, July 10. Secretary, Frank J. Bell, Billings.

North Dakota, at Fargo, July 11. Secretary, W. E. Hocking, Devils Lake.

Rhode Island, at State House, Providence, July 5, 6, and 7. Secretary, Albert L. Midgley, 315 Butler Exchange, Providence.

CALIFORNIA STATE DENTAL ASSOCIATION

The annual business meeting of the California State Dental Association will be held at the Hotel Ambassador, Los Angeles, on Tuesday morning, July 18, at ten o'clock. Matters of importance, including the election of officers, make a large attendance desirable.

B. FRANK GRAY, *Secretary,*
909 Hyde St., San Francisco, Cal.

NOTIFY ENTERTAINMENT COMMITTEE OF YOUR ARRIVAL

All special trains to the Los Angeles meeting will be met by automobiles. All individuals will be met at the station by machines bearing N.D.A. placards if they inform the chairman of the Entertainment Committee regarding the time of their arrival. Everyone is urged to take advantage of this invitation.

J. F. COOK, *Chairman,*
101 Merchants National Bank Bldg.,
Los Angeles, Cal.

THE AMERICAN SOCIETY OF DENTAL RADIOGRAPHERS

The second annual meeting of the American Society of Dental Radiographers will be held July 19, 1922, at the Ambassador Hotel, Los Angeles, California. The following papers will be presented at this meeting: "The Importance of Radiography in Referred Cases from the Medical Profession," J. A. Bliss, Los Angeles, Cal.; "Some Procedures Found Helpful in Making Dental Radiographs," J. A. Blue, Birmingham, Ala.; "A Plea for a Standard Terminology in Dental Radiography," Leland E. Carter, San Francisco, Cal.; "Problems of Dental Radiography," A. R. Ebenreiter, Los Angeles, Cal.; "Encouraging the Use of the X-Ray Machine by the Individual Dentist in His Office," J. D. McAlpin, San Francisco, Cal.; "Economical Value of the Dental Radiogram in the Practice of Dentistry," J. D. Millikin, San Francisco, Cal.; "Research Problems in Oral Radiography," Clarence O. Simpson, St. Louis, Mo.; "Radiography and Diagnosis from the Viewpoint of a Dental General Practitioner," Stephen A. Palmer, Poughkeepsie, N. Y.

H. C. MCKITTRICK, *President,*
I. O. O. F. Bldg., Indianapolis, Ind.
MARTIN DEWEY, *Secretary-Treas.,*
501 Fifth Ave., New York, N. Y.

UNITED STATES CIVIL SERVICE EXAMINATION: DENTIST

The United States Civil Service Commission announces an open competitive examination on July 10, 1922, for dentist. Vacancies in the Veterans' Bureau and Public Health Service in the states of Illinois, Michigan and Wisconsin at $2,400 to $4,800 per annum, and vacancies in positions requiring similar qualifications, at these or higher or lower salaries will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer, or promotion.

RANGE IN SALARY.—The entrance salary within the range stated will depend upon the qualifications of the appointee as shown in the examination and the duty to which assigned.

CITIZENSHIP.—All citizens of the United States who meet the requirements, both men and women, may enter this examination; appointing officers, however, have the legal right to specify the sex desired in requesting certification of eligibles. For this position in the Veterans' Bureau and Public Health Service men are desired.

SUBJECTS AND WEIGHTS.—Competitors will not be required to report for examination at any place, but will be rated on the following subjects, which will have the relative weights indicated on the scale of 100:

(1) Education and training.....30
(2) Experience 70

BASIS OF RATINGS.—Competitors will be rated upon their sworn statements in their applications and upon corroborative evidence.

REQUIREMENTS.—Applicants must show that they have been graduated from a dental school of recognized standing and that they

have had at least six months' active practice as a dentist. For eligibility for appointment at a salary over $3,000 a year, applicant must have had at least three years' active practice as a dentist.

AGE.—Applicants must not have reached their seventieth birthday on the date of the examination. Should the appointing officer so request, certificate will be made of eligibles who are within reasonable age limits.

RETIREMENT.—Classified employees who have reached the retirement age and have served fifteen years are entitled to retirement with an annuity. The retirement age for railway mail clerks is sixty-two years, for mechanics and post-office clerks sixty-five years and for others seventy years. A deduction of 2½ per cent is made from the monthly salary to provide for this annuity, which will be returned to persons leaving the service before retirement with 4 per cent interest compounded annually.

PHOTOGRAPHS.—Applicants must submit with their applications their unmounted photograph, taken within two years, with their name written thereon. Proofs or group photographs will not be accepted. Photographs will not be returned to applicants.

MEDICAL CERTIFICATE.—The medical certificate in the application form should be executed by a physician in the public health service where practicable.

Persons selected for appointment will also be required to submit to a physical examination before actually entering on duty.

APPLICATIONS.—Applicants should at once apply for form No. 1312 to the Secretary of the Seventh Civil Service District, Federal Building, Chicago, Ill., or to the Secretary of the United States Civil Service Board at any first or second class post-office.

Applications should be promptly executed, *INCLUDING THE MEDICAL CERTIFICATE,* and must be filed with the District Secretary at Chicago prior to the hour of closing business on July 10, 1922.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT

NAVY

Lieutenant J. R. Barber, Panther; to R. S., New York, N. Y.

Lieutenant P. A. McCole, marine expeditionary force, Santo Domingo; to R. S., Philadelphia, Pa.—*Army and Navy Register,* May 20, 1922.

Lieutenant E. M. Kenyon, Dixie; to Altair.

Lieutenant G. E. Nicholas, R. S., Boston, Mass.; to navy yard, Boston, Mass.—*Army and Navy Register,* June 3, 1922.

Lieutenant J. J. Haas, naval dispensary, Washington, D. C.; to Northwestern University, Chicago.

Lieutenant W. C. Carroll, marine expeditionary force, Haiti; to naval dispensary, Washington.

Lieutenant E. C. O'Connell, squadron 12; to Melville.

Lieutenant A. B. Ward, squadron 11; to Piaerie.

Lieutenant Commander W. L. Darnall, naval hospital, Mare Island, Cal.; to instruction at Northwestern University, Chicago, Ill.

Lieutenant D. A. Doherty, Black Hawk; to naval hospital, Newport, R. I.

Lieutenant T. P. Donahoe, North Dakota; to marine barracks, Quantico, Va.

Lieutenant T. P. Donahoe, registration accepted.

Lieutenant E. J. Fitzgerald, naval hospital, Newport, R. I.; to Black Hawk.

Lieutenant (J. G.) J. W. Grassl, marine barracks, Quantico, Va.; to North Dakota.—*Army and Navy Register,* June 10, 1922.

Lieutenant F. W. Mitchell, Huron; to Beaver.

Lieutenant (J. G.) R. D. Reid, Beaver; to Huron.—*Army and Navy Register,* June 17, 1922.

ARMY

Captain Egbert W. V. Cowan from duty at Walter Reed General Hospital, D. C., June 23, is assigned to permanent station at Fort Monroe, Va., and to temporary duty with summer training camp at Camp Meade, Md.—*Army and Navy Register,* May 20, 1922.

Major Lester C. Ogg, from duty at Columbus Barracks, Ohio, and will take station in Columbus, Ohio, and continue on duty as professor of military science and tactics at dental school of the Ohio State University.

Major John H. Snapp, from duties at disciplinary barracks, Fort Leavenworth, Kan., to Denver, Colo., Fitzsimons General Hospital, for duty.

Major Claudius G. Baker, from duty at Camp Lewis, Wash., to Fort Leavenworth (Kan.) disciplinary barracks for duty.

Captain Arne Sorum, from duty at Walter Reed General Hospital, D. C., about June 23; to Camp Eustis, Va., for duty and to temporary duty with summer training camp at Camp Meade, Md.

Captain Melville A. Sanderson, from duty at Walter Reed General Hospital, D. C., about June 23; to West Point (N. Y.) Military Academy for duty.

Captain John S. Ross, from duty at Walter Reed General Hospital about June 23; to Soldiers' Home, Washington, for duty.

Captain Henry A. Winslow, from duty at

Walter Reed General Hospital, D. C., about June 23; to Fort Slocum, N. Y., for duty.

First Lieutenant Rufus W. Leigh, from duty at Walter Reed General Hospital, D. C., about June 23; to Army Medical School, Washington, for duty and to temporary duty with summer training camp at Camp Meade, Md.

The following from duty at Walter Reed General Hospital, D. C., about June 23, are assigned to permanent station as set opposite their names and to temporary duty at permanent stations: Captains Frank A. Crane, Fort Snelling, Minn.; Emory C. Bardwell, Camp Travis, Tex.

The following from duty at Walter Reed General Hospital, D. C., about June 23, are assigned to permanent stations as set opposite their names and to temporary duty with summer training camps as indicated: Captains Joseph E. Eden, 4th corps area, permanent station, Fort Benning, Ga., temporary station, Camp McClellan, Ala.; Herbert E. Guthrie, 5th corps area, permanent station, Edgewood Arsenal, Md., temporary station, Camp Knox, Ky.; First Lieutenants Charles E. Callery, 4th corps area, permanent station, Camp A. A. Humphreys, Va., temporary station, Camp McClellan, Ala.; John C. Burr, 6th corps area, permanent station, Fort Howard, Md., temporary station, Camp Custer, Mich.

The following from duty at Walter Reed General Hospital, D. C., about June 23, are assigned to permanent stations as set opposite their names and to temporary duty with summer training camps as indicated: Captains Robert C. Craven, 1st corps area, permanent station, Fort Ethan Allen, Vt., temporary station, Camp Devens, Mass.; Ralph O. Leonard, 8th corps area, permanent station, Fort Bliss, Tex., temporary station, Fort Logan, Colo.

The following from duty as student officers at Walter Reed General Hospital, D. C., about June 23, will report at Walter Reed General Hospital for duty and to temporary duty with summer training camps as indicated; Captains Clarence C. Olson, Camp Custer, Mich.; William E. Sankey, headquarters 2d corps area, Governors Island, N. Y.—*Army and Navy Register,* May 27, 1922.

Lieutenant Colonel Albert R. White from treatment at Walter Reed General Hospital, D. C., and return to his station, general intermediate supply depot, Brooklyn, N. Y.

Captain Timothy F. Leary from duties at Military Academy, West Point, N. Y., to New York City and about Aug. 3 to Panama Canal Department for duty.—*Army and Navy Register,* June 3, 1922.

Lieutenant Colonel Harold L. Scott, to Fitzsimons General Hospital, Denver, Colo., for duty.

Captain Dell S. Gray, upon arrival in United States, will report to commanding general 2d corps area for assignment to duty and station.

Captain Charles J. Denholm, to Columbus Barracks, Ohio, for duty.—*Army and Navy Register,* June 10, 1922.

Major William A. Squires, Captains George M. Babbit, Leslie D. Baskin and Daniel Bratton form duty at Camp Dix, N. J., and will report by letter to commanding general, 2d corps area, for assignment to duty and station.—*Army and Navy Register,* June 17, 1922.

List of applicants who have accepted appointments in the Dental Reserve corps: Major J. W. Leggett, San Francisco, Cal.; First Lieutenant E. J. Cogan, Omaha, Neb.; First Lieutenant E. J. Gibson, Alameda, Cal.; First Lieutenant J. I. Weissman, Brooklyn, N. Y.; First Lieutenant A. W. Sweasey, San Leandro, Cal.